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Natural
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Conservation
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In cooperation with the
United States Department
of the Interior, Bureau of
Indian Affairs, and
Montana Agricultural
Experiment Station

MT651—Soil Survey of Sanders and Parts of Lincoln and Flathead Counties, Montana

Part I



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How to Use This Soil Survey

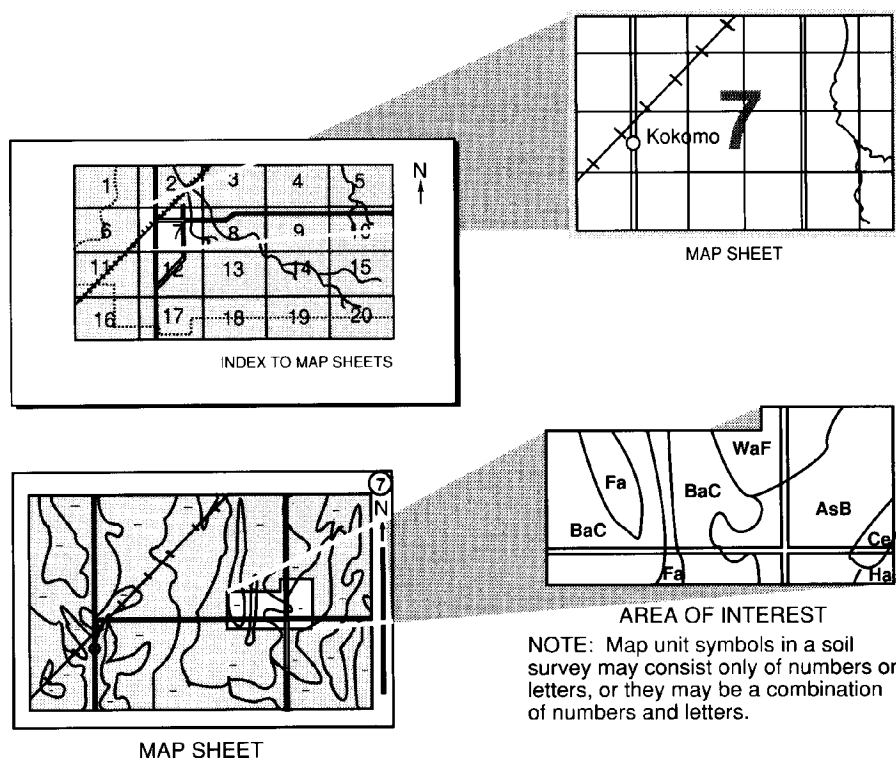
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (<http://websoilsurvey.nrcs.usda.gov/app/>).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1996. This survey was made cooperatively by the Natural Resources Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Eastern Sanders County Conservation District; the Green Mountain Conservation District; the Flathead Conservation District; the Lincoln Conservation District; and the United States Department of the Interior, Bureau of Indian Affairs. Financial assistance was provided by the United States Department of the Interior, Bureau of Indian Affairs.

The most current official data are available through the NRCS Soil Data Mart website at <http://soildatamart.nrcs.usda.gov>. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: View of the Clark Fork River Valley looking southeast toward the town of Plains.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

Contents

Part I

How To Use This Soil Survey	i
Index to Taxonomic Units	xiv
Index to Map Units	xvi
Summary of Tables	xxv
Foreword	xxvii
General Nature of the Survey Area	1
History	1
Industry, Transportation, and Recreation	2
Physiography, Drainage, and Geology	3
Mineral and Ground-Water Resources	7
Geothermal Resources and Seismic Activity	9
Climate	9
How This Survey Was Made	10
Formation and Classification of the Soils	17
Formation of the Soils	17
Climate	17
Living Organisms	17
Topography	17
Parent Material	18
Time	18
Classification of the Soils	18
Soil Series and Detailed Map Units	31
<i>Ashworth Series</i>	32
48C—Ashworth gravelly silt loam, 2 to 8 percent slopes	33
48E—Ashworth gravelly silt loam, 8 to 30 percent slopes	33
48F—Ashworth gravelly silt loam, 30 to 50 percent slopes	34
<i>Auggie Series</i>	34
12C—Auggie silt loam, 2 to 8 percent slopes	35
12E—Auggie silt loam, 8 to 30 percent slopes	35
<i>Backroad Series</i>	36
83B—Backroad gravelly silt loam, 0 to 4 percent slopes	37
83D—Backroad gravelly silt loam, 4 to 15 percent slopes	37
<i>Barzee Series</i>	38
808A—Barzee mucky peat, 0 to 2 percent slopes	38
<i>Bata Series</i>	39
86C—Bata gravelly silt loam, 2 to 8 percent slopes	40
86E—Bata gravelly silt loam, 8 to 30 percent slopes	40
<i>Battlebutte Series</i>	40
66F—Battlebutte gravelly loam, 30 to 60 percent slopes	41
166E—Battlebutte-Bigdraw-Welded tuff outcrop complex, 15 to 30 percent slopes	42
166F—Battlebutte-Welded tuff outcrop complex, 30 to 60 percent slopes	42
266E—Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes	43
366E—Battlebutte-Bigdraw gravelly loams, moist, 8 to 30 percent slopes	43
366F—Battlebutte-Bigdraw gravelly loams, moist, 30 to 60 percent slopes	44
<i>Beaverdump Series</i>	44
62B—Beaverdump gravelly loam, 0 to 4 percent slopes	45
62D—Beaverdump gravelly loam, 4 to 15 percent slopes	46
862E—Beaverdump gravelly loam, 15 to 35 percent slopes	46
<i>Beeskove Series</i>	46
39F—Beeskove gravelly loam, 35 to 60 percent slopes	47
77D—Beeskove gravelly loam, moist, 4 to 15 percent slopes	48
77E—Beeskove gravelly loam, moist, 15 to 35 percent slopes	48
77F—Beeskove gravelly loam, moist, 35 to 60 percent slopes	48
771G—Beeskove-Mollman-Rock outcrop complex, 40 to 80 percent slopes	49
<i>Belton Series</i>	49
14A—Belton silt loam, 0 to 2 percent slopes	50

14B—Belton silt loam, 2 to 8 percent slopes	51	250E—Bigarm-Rubble land complex, 15 to 30 percent slopes	62
14D—Belton silt loam, 8 to 15 percent slopes ...	51	250F—Bigarm-Rubble land complex, 30 to 60 percent slopes	63
14E—Belton silt loam, 15 to 35 percent slopes	51	252E—Bigarm, cool-Rubble land complex, 15 to 30 percent slopes	63
<i>Bemishave Series</i>	52	252F—Bigarm, cool-Rubble land complex, 30 to 60 percent slopes	64
28B—Bemishave loam, 0 to 4 percent slopes ...	52	350B—Bigarm gravelly loam, alluvial, 2 to 8 percent slopes	64
<i>Bendahl Series</i>	53	350D—Bigarm gravelly loam, alluvial, 8 to 15 percent slopes	64
98E—Bendahl gravelly silt loam, 15 to 30 percent slopes	54	350E—Bigarm gravelly loam, alluvial, 15 to 30 percent slopes	65
98F—Bendahl gravelly silt loam, 30 to 50 percent slopes	54	350F—Bigarm gravelly loam, alluvial, 30 to 50 percent slopes	65
<i>Berray Series</i>	55	<i>Bigbeaver Series</i>	66
94D—Berray silt loam, 4 to 15 percent slopes ..	56	66A—Bigbeaver silt loam, 0 to 2 percent slopes	66
<i>Bigarm Series</i>	56	893A—Bigbeaver silt loam, 0 to 2 percent slopes, frequently flooded	67
50B—Bigarm gravelly loam, 2 to 8 percent slopes	57	<i>Bigdraw Series</i>	67
50D—Bigarm gravelly loam, 8 to 15 percent slopes	57	168D—Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes	68
50E—Bigarm gravelly loam, 15 to 30 percent slopes	58	<i>Biglake Series</i>	69
50F—Bigarm cobbly loam, 30 to 60 percent slopes	58	91B—Biglake gravelly loam, 0 to 8 percent slopes	69
52D—Bigarm gravelly loam, cool, 4 to 15 percent slopes	58	<i>Bignell Series</i>	70
52E—Bigarm gravelly loam, cool, 15 to 30 percent slopes	59	82B—Bignell gravelly loam, 0 to 4 percent slopes	71
52F—Bigarm cobbly loam, cool, 30 to 60 percent slopes	59	82D—Bignell gravelly loam, 4 to 15 percent slopes	71
148C—Bigarm gravelly loam, cool, 2 to 8 percent slopes, very stony	59	82E—Bignell gravelly loam, 15 to 35 percent slopes	71
148E—Bigarm gravelly loam, cool, 8 to 25 percent slopes, very stony	60	<i>Blackcreek Series</i>	72
150E—Bigarm-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	60	74A—Blackcreek silt loam, 0 to 2 percent slopes	72
150F—Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	61	<i>Blacklake Series</i>	73
152E—Bigarm, cool-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	61	72A—Blacklake mucky peat, 0 to 1 percent slopes	74
152F—Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	62		

<i>Bohnly Series</i>	74	35E—Courville gravelly silt loam, 8 to 30 percent slopes	90
10A—Bohnly silt loam, 0 to 2 percent slopes	75	35F—Courville gravelly silt loam, 30 to 50 percent slopes	90
<i>Bolack Series</i>	75	221F—Courville-Rockhill-Rock outcrop complex, 30 to 50 percent slopes	90
11A—Bolack silt loam, 0 to 2 percent slopes	76	222F—Courville gravelly silt loam, dry, 30 to 50 percent slopes	91
<i>Bonnash Series</i>	76	<i>Crystalex Series</i>	91
60B—Bonnash gravelly silt loam, 0 to 4 percent slopes	77	DA—Denied access	92
860D—Bonnash gravelly silt loam, 4 to 15 percent slopes	78	DAM—Dam	92
860E—Bonnash gravelly silt loam, 15 to 35 percent slopes	78	<i>Dewberry Series</i>	92
<i>Bowlake Series</i>	78	88C—Dewberry silt loam, 2 to 8 percent slopes	93
56A—Bowlake gravelly loam, 0 to 2 percent slopes	79	88E—Dewberry gravelly silt loam, 8 to 45 percent slopes	94
56B—Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes	79	<i>Doglake Series</i>	94
<i>Cabinet Series</i>	80	98C—Doglake extremely cobbly loam, 2 to 12 percent slopes	95
<i>Camascreek Series</i>	81	<i>Dryfork Series</i>	95
90A—Camascreek silt loam, 0 to 2 percent slopes	83	18B—Dryfork silt loam, 0 to 4 percent slopes	96
<i>Clearcreek Series</i>	83	118B—Dryfork-Selow silt loams, 0 to 4 percent slopes	96
96A—Clearcreek silt loam, 0 to 2 percent slopes	84	118D—Dryfork-Kerrdam silt loams, 4 to 15 percent slopes	97
<i>Combest Series</i>	84	218D—Dryfork-Selow silt loams, 4 to 15 percent slopes	97
21E—Combest gravelly silt loam, 15 to 35 percent slopes	85	<i>Dubay Series</i>	98
21F—Combest gravelly silt loam, 35 to 60 percent slopes	85	24B—Dubay silt loam, 0 to 4 percent slopes	99
211G—Combest-Rubble land complex, 40 to 70 percent slopes	86	24D—Dubay silt loam, 4 to 15 percent slopes ...	99
821D—Combest gravelly silt loam, 4 to 15 percent slopes	86	824E—Dubay silt loam, 15 to 30 percent slopes	99
<i>Courvash Series</i>	86	<i>Eaglewing Series</i>	100
96D—Courvash cobbly silt loam, 4 to 15 percent slopes	88	28E—Eaglewing gravelly loam, 8 to 30 percent slopes	101
96E—Courvash cobbly silt loam, 15 to 35 percent slopes	88	28F—Eaglewing gravelly loam, 30 to 50 percent slopes	101
<i>Courville Series</i>	88	<i>Elkrock Series</i>	101
22C—Courville gravelly silt loam, 2 to 8 percent slopes	89		

47C—Elkrock cobbly silt loam, 2 to 6 percent slopes, stony	102	<i>Firetower Series</i>	112
47D—Elkrock gravelly silt loam, 4 to 15 percent slopes	102	<i>Flott Series</i>	113
471D—Elkrock cobbly silt loam, 4 to 15 percent slopes, extremely bouldery	103	61F—Flott gravelly loam, 30 to 50 percent slopes	114
472B—Elkrock gravelly silt loam, moist, 0 to 4 percent slopes	103	62F—Flott gravelly loam, dry, 30 to 50 percent slopes	114
472D—Elkrock gravelly silt loam, moist, 4 to 15 percent slopes	104	<i>Gardencreek Series</i>	114
472F—Elkrock gravelly silt loam, moist, 30 to 60 percent slopes	104	95A—Gardencreek silty clay loam, 0 to 2 percent slopes	115
473D—Elkrock-Selon complex, 4 to 15 percent slopes	104	<i>Gird Series</i>	116
<i>Felan Series</i>	105	3A—Gird silt loam, 0 to 4 percent slopes	117
46F—Felan gravelly silt loam, 35 to 60 percent slopes	106	3B—Gird silt loam, 4 to 8 percent slopes	117
76E—Felan gravelly silt loam, moist, 15 to 35 percent slopes	106	103B—Gird-McCollum complex, 0 to 4 percent slopes	117
76F—Felan gravelly silt loam, moist, 35 to 60 percent slopes	106	261C—Gird-McCollum complex, 4 to 8 percent slopes	118
<i>Fernline Series</i>	107	<i>Glaciercreek Series</i>	118
78B—Fernline silt loam, 0 to 4 percent slopes	108	67A—Glaciercreek gravelly silt loam, cool, 0 to 2 percent slopes	119
78D—Fernline silt loam, 4 to 15 percent slopes	108	67C—Glaciercreek gravelly silt loam, cool, 2 to 8 percent slopes	120
781D—Fernline-Cabinet silt loams, 4 to 15 percent slopes	108	671C—Glaciercreek gravelly silt loam, 2 to 8 percent slopes	120
781E—Fernline-Cabinet silt loams, 15 to 30 percent slopes	109	671E—Glaciercreek gravelly silt loam, 8 to 30 percent slopes	120
<i>Finleypoint Series</i>	109	867E—Glaciercreek gravelly silt loam, cool, 8 to 30 percent slopes	121
54E—Finleypoint gravelly loam, 15 to 30 percent slopes	110	867F—Glaciercreek gravelly silt loam, cool, 30 to 45 percent slopes	121
54F—Finleypoint gravelly loam, 30 to 60 percent slopes	111	<i>Grantsdale Series</i>	121
64E—Finleypoint gravelly loam, moist, 15 to 30 percent slopes	111	1A—Grantsdale silt loam, 0 to 4 percent slopes	122
64F—Finleypoint gravelly loam, moist, 30 to 60 percent slopes	111	<i>Half Moon Series</i>	123
254F—Finleypoint-Rubble land complex, 30 to 60 percent slopes	112	70B—Half Moon silt loam, 2 to 8 percent slopes	124
		70D—Half Moon silt loam, 8 to 15 percent slopes	124
		70E—Half Moon silt loam, 15 to 30 percent slopes	124
		291B—Half Moon silt loam, cool, 2 to 8 percent slopes	125

291D—Half Moon silt loam, cool, 8 to 15 percent slopes	125	51A—Horseplains-Riverwash complex, 0 to 2 percent slopes	136
291E—Half Moon silt loam, cool, 15 to 35 percent slopes	125	93A—Horseplains fine sandy loam, 0 to 2 percent slopes	137
291F—Half Moon silt loam, cool, 35 to 60 percent slopes	126	251A—Horseplains fine sandy loam, gravelly substratum, 0 to 2 percent slopes	137
<i>Hewolf Series</i>	126	<i>Ibex Series</i>	138
8A—Hewolf gravelly loam, 0 to 2 percent slopes	127	895A—Ibex silt loam, 0 to 2 percent slopes	139
<i>Hogheaven Series</i>	127	<i>Iffgulch Series</i>	139
85A—Hogheaven silt loam, 0 to 2 percent slopes	128	89B—Iffgulch clay, 0 to 4 percent slopes	140
<i>Hogsby Series</i>	129	<i>Irvine Series</i>	140
53F—Hogsby-Rubble land-Rock outcrop complex, 15 to 60 percent slopes	129	116E—Irvine-Round Butte silty clay loams, 8 to 35 percent slopes	141
153F—Hogsby-Finleypoint-Rock outcrop complex, 30 to 60 percent slopes	130	116F—Irvine-Lake sediment outcrop complex, 35 to 60 percent slopes	142
<i>Holloway Series</i>	130	<i>Jocko Series</i>	142
40E—Holloway gravelly silt loam, 15 to 35 percent slopes	131	7B—Jocko gravelly loam, 0 to 4 percent slopes	143
40F—Holloway gravelly silt loam, 35 to 60 percent slopes	132	<i>Kerrdam Series</i>	143
40G—Holloway-Rubble land complex, 40 to 70 percent slopes	132	17B—Kerrdam silt loam, 0 to 4 percent slopes	144
42E—Holloway gravelly silt loam, cool, 15 to 35 percent slopes	132	17D—Kerrdam silt loam, 4 to 15 percent slopes	144
42F—Holloway gravelly silt loam, cool, 35 to 60 percent slopes	133	17E—Kerrdam silt loam, 15 to 35 percent slopes	145
42G—Holloway, cool-Rock outcrop complex, 40 to 70 percent slopes	133	117E—Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes	145
143F—Holloway-Waldbillig gravelly silt loams, 30 to 50 percent slopes	134	217E—Kerrdam-Round Butte-Irvine complex, 8 to 35 percent slopes	146
144F—Holloway-Waldbillig gravelly silt loams, cool, 30 to 50 percent slopes	134	<i>Koyokee Series</i>	146
322E—Holloway gravelly silt loam, moist, 15 to 35 percent slopes	135	67D—Koyokee gravelly loam, 4 to 15 percent slopes	147
322F—Holloway gravelly silt loam, moist, 35 to 60 percent slopes	135	67E—Koyokee gravelly loam, 15 to 30 percent slopes	148
323G—Holloway, moist-Rock outcrop complex, 40 to 70 percent slopes	135	<i>Krause Series</i>	148
<i>Horseplains Series</i>	136	34C—Krause gravelly silt loam, 2 to 8 percent slopes	149
		341C—Krause very cobbly silt loam, 2 to 8 percent slopes	149
		834F—Krause gravelly silt loam, 15 to 45 percent slopes	150

<i>Lamoose Series</i>	150	84F—Lozeau gravelly loam, 30 to 50 percent slopes	165
4A—Lamoose loam, moist, 0 to 2 percent slopes	151	<i>Marklepass Series</i>	165
9A—Lamoose silt loam, 0 to 2 percent slopes	151	12A—Marklepass silty clay loam, 0 to 2 percent slopes	166
<i>Larchpoint Series</i>	152	112A—Marklepass-Slickspots complex, 0 to 4 percent slopes	166
65A—Larchpoint silt loam, 0 to 2 percent slopes	153	<i>McCollum Series</i>	167
<i>Lesier Series</i>	153	35C—McCollum fine sandy loam, 4 to 8 percent slopes	167
99C—Lesier gravelly silt loam, 2 to 8 percent slopes	154	292B—McCollum fine sandy loam, 0 to 4 percent slopes	168
99E—Lesier gravelly silt loam, 8 to 30 percent slopes	154	351C—McCollum-Belton fine sandy loams, 4 to 8 percent slopes	168
<i>Lionwood Series</i>	155	351D—McCollum-Belton fine sandy loams, 8 to 15 percent slopes	169
64B—Lionwood loam, 0 to 4 percent slopes ...	156	<i>McDonald Series</i>	169
641D—Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes	156	58B—McDonald silt loam, 2 to 8 percent slopes	170
641E—Lionwood-Scotmont-Whitepine complex, 15 to 35 percent slopes	157	58D—McDonald silt loam, 8 to 15 percent slopes	170
<i>Loneman Series</i>	157	58E—McDonald silt loam, 15 to 30 percent slopes	171
884E—Loneman silt loam, 15 to 35 percent slopes	159	<i>McLangor Series</i>	171
884F—Loneman silt loam, 35 to 60 percent slopes	159	99A—McLangor-Meadowpeak complex, 0 to 2 percent slopes	172
<i>Lonepine Series</i>	159	807A—McLangor mucky peat, 0 to 2 percent slopes	173
15B—Lonepine silt loam, 2 to 8 percent slopes	160	<i>Meadowpass Series</i>	173
15D—Lonepine-Vincom silt loams, 4 to 15 percent slopes	161	69B—Meadowpass gravelly loam, 2 to 8 percent slopes	174
215B—Lonepine-Round Butte complex, 2 to 8 percent slopes	161	<i>Meadowpeak Series</i>	175
<i>Loonlake Series</i>	162	73A—Meadowpeak silt loam, 0 to 2 percent slopes	175
71D—Loonlake gravelly silt loam, 4 to 15 percent slopes	163	731A—Meadowpeak-Firetower silt loams, 0 to 2 percent slopes	176
71E—Loonlake gravelly silt loam, 15 to 30 percent slopes	163	732A—Meadowpeak silt loam, 0 to 2 percent slopes, frequently flooded	176
<i>Lozeau Series</i>	163	<i>Millpocket Series</i>	177
84E—Lozeau gravelly loam, 8 to 30 percent slopes	164		

72B—Millpocket silty clay loam, 2 to 8 percent slopes	178	971E—Mollman gravelly loam, dry, 15 to 30 percent slopes	189
<i>Minesinger Series</i>	178	971F—Mollman gravelly loam, dry, 30 to 50 percent slopes	189
57D—Minesinger gravelly loam, 4 to 15 percent slopes	179	<i>Murrstead Series</i>	189
57E—Minesinger stony loam, 15 to 30 percent slopes	179	6A—Murrstead mucky peat, 0 to 2 percent slopes	191
59D—Minesinger stony loam, cool, 4 to 15 percent slopes	180	<i>Niarada Series</i>	191
59E—Minesinger stony loam, cool, 15 to 30 percent slopes	180	55D—Niarada gravelly loam, 4 to 15 percent slopes	192
59F—Minesinger stony loam, cool, 30 to 50 percent slopes	180	55E—Niarada gravelly loam, 15 to 30 percent slopes	192
<i>Mitten Series</i>	181	55F—Niarada gravelly loam, 30 to 60 percent slopes	192
32E—Mitten gravelly silt loam, 15 to 35 percent slopes	182	60D—Niarada gravelly loam, cool, 4 to 15 percent slopes	193
32F—Mitten gravelly silt loam, 35 to 60 percent slopes	182	60E—Niarada gravelly loam, cool, 15 to 30 percent slopes	193
32G—Mitten-Rubble land complex, 40 to 70 percent slopes	182	60F—Niarada gravelly loam, cool, 30 to 60 percent slopes	194
33E—Mitten gravelly silt loam, dry, 15 to 35 percent slopes	183	<i>Noxlin Series</i>	194
33F—Mitten gravelly silt loam, dry, 35 to 60 percent slopes	183	81E—Noxlin silt loam, 8 to 35 percent slopes, stony	195
132F—Mitten-Tevis complex, 35 to 60 percent slopes	183	811D—Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony	195
374F—Mitten-Rock outcrop complex, 40 to 70 percent slopes	184	<i>Oldtrail Series</i>	196
<i>Mocmont Series</i>	184	41B—Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes	197
123E—Mocmont-Winkler complex, 8 to 35 percent slopes	185	92C—Oldtrail gravelly sandy loam, 0 to 8 percent slopes	197
<i>Moiese Series</i>	186	<i>Pashua Series</i>	198
2B—Moiese gravelly loam, 0 to 4 percent slopes	186	87E—Pashua gravelly loam, 8 to 30 percent slopes	199
<i>Mollman Series</i>	187	<i>Petty Series</i>	199
97F—Mollman gravelly loam, 30 to 50 percent slopes	188	47E—Petty gravelly loam, 8 to 30 percent slopes	200
897C—Mollman gravelly loam, 2 to 8 percent slopes	188	47F—Petty gravelly loam, 30 to 50 percent slopes	200
897E—Mollman gravelly loam, 8 to 30 percent slopes	188	47G—Petty-Rubble land complex, 40 to 70 percent slopes	201
		<i>Phillcher Series</i>	201

45D—Phillcher gravelly silt loam, 8 to 30 percent slopes	202	<i>Round Butte Series</i>	215
45G—Phillcher-Rock outcrop complex, 40 to 70 percent slopes	202	13A—Round Butte silty clay loam, 0 to 2 percent slopes	216
<i>Redlock Series</i>	203	13B—Round Butte silty clay loam, 2 to 8 percent slopes	217
791B—Redlock-Fernline silt loams, 0 to 4 percent slopes	205	113D—Round Butte-Irvine silty clay loams, 4 to 15 percent slopes	217
791D—Redlock-Fernline silt loams, 4 to 15 percent slopes	205	213A—Round Butte-Selow complex, 0 to 2 percent slopes	218
791E—Redlock-Fernline silt loams, 15 to 35 percent slopes	206	213B—Round Butte-Selow complex, 2 to 8 percent slopes	218
792D—Redlock-Fernline-Iffgulch complex, 0 to 15 percent slopes	206	<i>Rumblecreek Series</i>	219
<i>Remount Series</i>	207	36D—Rumblecreek gravelly loam, 4 to 15 percent slopes	219
97C—Remount very gravelly loam, 2 to 12 percent slopes	208	36E—Rumblecreek gravelly loam, 15 to 30 percent slopes	220
97E—Remount very gravelly loam, 12 to 25 percent slopes	208	36F—Rumblecreek gravelly loam, 30 to 50 percent slopes	220
197C—Remount-Bowlake complex, 2 to 12 percent slopes	209	37D—Rumblecreek gravelly loam, dry, 4 to 15 percent slopes	221
<i>Repp Series</i>	209	37E—Rumblecreek gravelly loam, dry, 15 to 30 percent slopes	221
24E—Repp gravelly loam, 15 to 35 percent slopes	210	37F—Rumblecreek gravelly loam, dry, 30 to 50 percent slopes	221
24F—Repp gravelly loam, 35 to 60 percent slopes	210	392D—Rumblecreek gravelly loam, 8 to 15 percent slopes, stony	222
26F—Repp gravelly loam, cool, 35 to 60 percent slopes	211	392E—Rumblecreek gravelly loam, 15 to 30 percent slopes, stony	222
126G—Repp-Rock outcrop complex, 40 to 70 percent slopes	211	<i>Sacheen Series</i>	222
<i>Revais Series</i>	211	6B—Sacheen loamy fine sand, dry, 2 to 8 percent slopes	223
94A—Revais silt loam, 0 to 2 percent slopes	212	6E—Sacheen loamy fine sand, dry, 8 to 30 percent slopes	223
151A—Revais silt loam, gravelly substratum, 0 to 2 percent slopes	213	41C—Sacheen loamy fine sand, 2 to 8 percent slopes	223
200—Riverwash	213	41E—Sacheen loamy fine sand, 8 to 30 percent slopes	224
100—Rock outcrop-Rubble land complex	213	41F—Sacheen loamy fine sand, 30 to 60 percent slopes	224
<i>Rockhill Series</i>	213	106D—Sacheen-Dune land complex, 4 to 15 percent slopes	225
631E—Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes	214		
632F—Rockhill-Rock outcrop complex, 15 to 60 percent slopes	215		

411E—Sacheen-Rock outcrop complex, 8 to 30 percent slopes	225	<i>Stevie Series</i>	238
<i>Scotmont Series</i>	225	87F—Stevie gravelly silt loam, 35 to 60 percent slopes	239
61B—Scotmont fine sandy loam, 0 to 4 percent slopes	227	871G—Stevie-Rock outcrop complex, 40 to 70 percent slopes	239
61D—Scotmont fine sandy loam, 4 to 15 percent slopes	227	887E—Stevie gravelly silt loam, 15 to 35 percent slopes	239
<i>Selon Series</i>	227	<i>Tallcreek Series</i>	240
42B—Selon fine sandy loam, 0 to 4 percent slopes	228	75B—Tallcreek silt loam, 0 to 4 percent slopes	241
42D—Selon fine sandy loam, 4 to 15 percent slopes	228	<i>Tamarack Series</i>	241
421B—Selon fine sandy loam, moist, 0 to 4 percent slopes	229	69C—Tamarack loam, 2 to 8 percent slopes ...	242
421D—Selon fine sandy loam, moist, 4 to 15 percent slopes	229	691B—Tamarack-Crystalex complex, 0 to 4 percent slopes	242
421E—Selon fine sandy loam, moist, 15 to 30 percent slopes	230	691D—Tamarack-Crystalex complex, 4 to 15 percent slopes	243
422F—Selon-Bemishave complex, 15 to 60 percent slopes	230	691E—Tamarack-Crystalex complex, 15 to 30 percent slopes	243
842E—Selon fine sandy loam, 15 to 30 percent slopes	230	691F—Tamarack-Crystalex complex, 30 to 60 percent slopes	244
842F—Selon fine sandy loam, 30 to 60 percent slopes	231	692B—Tamarack fine sandy loam, 0 to 4 percent slopes	244
<i>Selow Series</i>	231	<i>Tevis Series</i>	245
<i>Selway Series</i>	232	30E—Tevis gravelly loam, 15 to 35 percent slopes	246
89E—Selway gravelly sandy loam, 8 to 30 percent slopes	233	30F—Tevis gravelly loam, 35 to 60 percent slopes	246
<i>Sharrott Series</i>	233	30G—Tevis-Rubble land complex, 40 to 70 percent slopes	246
80F—Sharrott-Rubble land-Rock outcrop complex, 15 to 60 percent slopes	234	31E—Tevis gravelly loam, dry, 15 to 35 percent slopes	247
82F—Sharrott, cool-Rock outcrop-Rubble land complex, 15 to 60 percent slopes	234	31F—Tevis gravelly loam, dry, 35 to 60 percent slopes	247
<i>Sonyok Series</i>	235	441F—Tevis-Rock outcrop complex, 30 to 60 percent slopes	247
513A—Sonyok silty clay loam, 0 to 4 percent slopes	236	<i>Totelake Series</i>	248
<i>Stargulch Series</i>	236	21B—Totelake gravelly loam, 2 to 8 percent slopes	248
91D—Stargulch very fine sandy loam, 4 to 15 percent slopes	237	21D—Totelake gravelly loam, 8 to 15 percent slopes	249
891B—Stargulch very fine sandy loam, 0 to 4 percent slopes	237	<i>Upsata Series</i>	249

68C—Upsata gravelly silt loam, 2 to 8 percent slopes	250	25D—Wildgen gravelly loam, 4 to 15 percent slopes	262
68E—Upsata gravelly silt loam, 8 to 30 percent slopes	250	25E—Wildgen gravelly loam, 15 to 30 percent slopes	262
68F—Upsata gravelly silt loam, 30 to 60 percent slopes	251	25F—Wildgen gravelly loam, 30 to 50 percent slopes	262
<i>Vincom Series</i>	251	27D—Wildgen gravelly loam, dry, 4 to 15 percent slopes	263
19F—Vincom silt loam, 35 to 60 percent slopes	252	27E—Wildgen gravelly loam, dry, 15 to 30 percent slopes	263
119E—Vincom-Lonepine silt loams, 15 to 35 percent slopes	253	27F—Wildgen gravelly loam, dry, 30 to 50 percent slopes	263
119F—Vincom-Lake sediment outcrop complex, 35 to 60 percent slopes	253	<i>Winfall Series</i>	264
<i>Waldbillig Series</i>	253	34E—Winfall gravelly loam, 8 to 30 percent slopes	264
43E—Waldbillig gravelly silt loam, 8 to 30 percent slopes	254	34F—Winfall gravelly loam, 30 to 50 percent slopes	265
44D—Waldbillig gravelly silt loam, cool, 4 to 15 percent slopes	255	134E—Winfall-Courville complex, 8 to 30 percent slopes	265
58F—Waldbillig gravelly silt loam, moist, 30 to 50 percent slopes	255	138E—Winfall-Courville complex, dry, 8 to 30 percent slopes	266
143E—Waldbillig-Holloway gravelly silt loams, 8 to 30 percent slopes	255	522F—Winfall-Courville complex, 30 to 60 percent slopes	266
144E—Waldbillig-Holloway gravelly silt loams, cool, 8 to 30 percent slopes	256	<i>Winkler Series</i>	267
582E—Waldbillig-Holloway gravelly silt loams, moist, 15 to 30 percent slopes	256	20E—Winkler gravelly loam, 15 to 35 percent slopes	267
582F—Waldbillig-Holloway gravelly silt loams, moist, 30 to 50 percent slopes	257	20F—Winkler gravelly loam, 35 to 60 percent slopes	268
858E—Waldbillig gravelly silt loam, moist, 8 to 30 percent slopes	257	20G—Winkler-Rubble land complex, 40 to 70 percent slopes	268
W—Water	258	22E—Winkler gravelly sandy loam, cool, 15 to 35 percent slopes	269
<i>Whitearth Series</i>	258	22F—Winkler gravelly sandy loam, cool, 35 to 60 percent slopes	269
5B—Whitearth silt loam, 0 to 4 percent slopes	258	22G—Winkler, cool-Rubble land complex, 40 to 70 percent slopes	269
105B—Whitearth-Slickspots complex, 2 to 8 percent slopes	259	120G—Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes	270
<i>Whiteline Series</i>	259	122E—Winkler, cool-Sharrott, cool-Rock outcrop complex, 8 to 40 percent slopes	270
85B—Whiteline silt loam, 0 to 4 percent slopes	260		
85D—Whiteline silt loam, 4 to 15 percent slopes	260		
<i>Wildgen Series</i>	261		

122G—Winkler, cool-Sharrott, cool-Rubble land complex, 40 to 85 percent slopes	271	Agronomy	13
532E—Winkler-Sharrott-Rock outcrop complex, 8 to 40 percent slopes	271	Cropland Limitations and Hazards	14
<i>Yellowbay Series</i>	272	Crop Yield Estimates	15
54C—Yellowbay gravelly loam, 2 to 8 percent slopes	273	Pasture and Hayland Management	16
541C—Yellowbay gravelly loam, moist, 2 to 8 percent slopes	273	Land Capability Classification	16
542F—Yellowbay-Selon-Bemishave complex, 15 to 60 percent slopes	273	Prime Farmland and Other Important Farmland	17
543F—Yellowbay-Selon-Sacheen complex, 15 to 60 percent slopes	274	Erosion Factors	18
<i>Yourame Series</i>	275	Range	81
23D—Yourame gravelly loam, 4 to 15 percent slopes	276	Similarity Index	82
23E—Yourame gravelly loam, 15 to 30 percent slopes	276	Rangeland Management	82
23F—Yourame gravelly loam, 30 to 50 percent slopes	276	Understory Management	83
29E—Yourame gravelly loam, dry, 15 to 30 percent slopes	277	Forestland	181
29F—Yourame gravelly loam, dry, 30 to 50 percent slopes	277	Woodland Ordination System	182
55B—Yourame gravelly loam, 0 to 4 percent slopes	277	Forestland Management and Productivity	183
123D—Yourame-Wildgen gravelly loams, 8 to 30 percent slopes	278	Main Forest Access Road Limitations and Hazards	184
References	279	Recreation	251
Glossary	281	Wildlife Habitat	287
Part II		Elements of Wildlife Habitat	287
How To Use This Soil Survey	i	Kinds of Wildlife Habitat	287
Detailed Soil Map Unit Legend	iv	Wildlife of Sanders and Parts of Lincoln and Flathead Counties	288
Summary of Tables	xii	Engineering	291
		Building Site Development	291
		Sanitary Facilities	292
		Waste Management	293
		Construction Materials	294
		Water Management	295
		Soil Properties	441
		Engineering Index Properties	441
		Physical and Chemical Properties	442
		Water Features	444
		Soil Features	445
		References	673
		Glossary	675

Index to Taxonomic Units

Ashworth Series	32	Flott Series	113
Auggie Series	34	Gardencreek Series	114
Backroad Series	36	Gird Series	116
Barzee Series	38	Glaciercreek Series	118
Bata Series	39	Grantsdale Series	121
Battlebutte Series	40	Half Moon Series	123
Beaverdump Series	44	Hewolf Series	126
Beeskove Series	46	Hogheaven Series	127
Belton Series	49	Hogsby Series	129
Bemishave Series	52	Holloway Series	130
Bendahl Series	53	Horseplains Series	136
Berray Series	55	Ibex Series	138
Bigarm Series	56	Iffgulch Series	139
Bigbeaver Series	66	Irvine Series	140
Bigdraw Series	67	Jocko Series	142
Biglake Series	69	Kerrdam Series	143
Bignell Series	70	Koyokee Series	146
Blackcreek Series	72	Krause Series	148
Blacklake Series	73	Lamoose Series	150
Bohnlly Series	74	Larchpoint Series	152
Bolack Series	75	Lesier Series	153
Bonnash Series	76	Lionwood Series	155
Bowlake Series	78	Loneman Series	157
Cabinet Series	80	Lonepine Series	159
Camascreek Series	81	Loonlake Series	162
Clearcreek Series	83	Lozeau Series	163
Combest Series	84	Marklepass Series	165
Courvash Series	86	McCollum Series	167
Courville Series	88	McDonald Series	169
Crystalex Series	91	McLangor Series	171
Dewberry Series	92	Meadowpass Series	173
Doglake Series	94	Meadowpeak Series	175
Dryfork Series	95	Millpocket Series	177
Dubay Series	98	Minesinger Series	178
Eaglewing Series	100	Mitten Series	181
Elkrock Series	101	Mocmont Series	184
Felan Series	105	Moiese Series	186
Fernline Series	107	Mollman Series	187
Finleypoint Series	109	Murrstead Series	189
Firetower Series	112	Niarada Series	191

Noxlin Series	194	Sonyok Series	235
Oldtrail Series	196	Stargulch Series	236
Pashua Series	198	Stevie Series	238
Petty Series	199	Tallcreek Series	240
Phillcher Series	201	Tamarack Series	241
Redlock Series	203	Tervis Series	245
Remount Series	207	Totelake Series	248
Repp Series	209	Upsata Series	249
Revais Series	211	Vincom Series	251
Rockhill Series	213	Waldbillig Series	253
Round Butte Series	215	Whitearth Series	258
Rumblecreek Series	219	Whitepine Series	259
Sacheen Series	222	Wildgen Series	261
Scotmont Series	225	Winfall Series	264
Selon Series	227	Winkler Series	267
Selow Series	231	Yellowbay Series	272
Selway Series	232	Yourame Series	275
Sharrott Series	233		

Index to Map Units

1A—Grantsdale silt loam, 0 to 4 percent slopes	122	15D—Lonepine-Vincom silt loams, 4 to 15 percent slopes	161
2B—Moiese gravelly loam, 0 to 4 percent slopes	186	17B—Kerrdam silt loam, 0 to 4 percent slopes	144
3A—Gird silt loam, 0 to 4 percent slopes	117	17D—Kerrdam silt loam, 4 to 15 percent slopes	144
3B—Gird silt loam, 4 to 8 percent slopes	117	17E—Kerrdam silt loam, 15 to 35 percent slopes	145
4A—Lamoose loam, moist, 0 to 2 percent slopes	151	18B—Dryfork silt loam, 0 to 4 percent slopes ...	96
5B—Whitethorn silt loam, 0 to 4 percent slopes	258	19F—Vincom silt loam, 35 to 60 percent slopes	252
6A—Murrstead mucky peat, 0 to 2 percent slopes	191	20E—Winkler gravelly loam, 15 to 35 percent slopes	267
6B—Sacheen loamy fine sand, dry, 2 to 8 percent slopes	223	20F—Winkler gravelly loam, 35 to 60 percent slopes	268
6E—Sacheen loamy fine sand, dry, 8 to 30 percent slopes	223	20G—Winkler-Rubble land complex, 40 to 70 percent slopes	268
7B—Jocko gravelly loam, 0 to 4 percent slopes	143	21B—Totelake gravelly loam, 2 to 8 percent slopes	248
8A—Hewolf gravelly loam, 0 to 2 percent slopes	127	21D—Totelake gravelly loam, 8 to 15 percent slopes	249
9A—Lamoose silt loam, 0 to 2 percent slopes	151	21E—Combest gravelly silt loam, 15 to 35 percent slopes	85
10A—Bohnlly silt loam, 0 to 2 percent slopes	75	21F—Combest gravelly silt loam, 35 to 60 percent slopes	85
11A—Bolack silt loam, 0 to 2 percent slopes	76	22C—Courville gravelly silt loam, 2 to 8 percent slopes	89
12A—Marklepass silty clay loam, 0 to 2 percent slopes	166	22E—Winkler gravelly sandy loam, cool, 15 to 35 percent slopes	269
12C—Auggie silt loam, 2 to 8 percent slopes	35	22F—Winkler gravelly sandy loam, cool, 35 to 60 percent slopes	269
12E—Auggie silt loam, 8 to 30 percent slopes	35	22G—Winkler, cool-Rubble land complex, 40 to 70 percent slopes	269
13A—Round Butte silty clay loam, 0 to 2 percent slopes	216	23D—Yourame gravelly loam, 4 to 15 percent slopes	276
13B—Round Butte silty clay loam, 2 to 8 percent slopes	217	23E—Yourame gravelly loam, 15 to 30 percent slopes	276
14A—Belton silt loam, 0 to 2 percent slopes	50	23F—Yourame gravelly loam, 30 to 50 percent slopes	276
14B—Belton silt loam, 2 to 8 percent slopes	51	24B—Dubay silt loam, 0 to 4 percent slopes	99
14D—Belton silt loam, 8 to 15 percent slopes ...	51		
14E—Belton silt loam, 15 to 35 percent slopes	51		
15B—Lonepine silt loam, 2 to 8 percent slopes	160		

24D—Dubay silt loam, 4 to 15 percent slopes	99	32F—Mitten gravelly silt loam, 35 to 60 percent slopes	182
24E—Repp gravelly loam, 15 to 35 percent slopes	210	32G—Mitten-Rubble land complex, 40 to 70 percent slopes	182
24F—Repp gravelly loam, 35 to 60 percent slopes	210	33E—Mitten gravelly silt loam, dry, 15 to 35 percent slopes	183
25D—Wildgen gravelly loam, 4 to 15 percent slopes	262	33F—Mitten gravelly silt loam, dry, 35 to 60 percent slopes	183
25E—Wildgen gravelly loam, 15 to 30 percent slopes	262	34C—Krause gravelly silt loam, 2 to 8 percent slopes	149
25F—Wildgen gravelly loam, 30 to 50 percent slopes	262	34E—Winfall gravelly loam, 8 to 30 percent slopes	264
26F—Repp gravelly loam, cool, 35 to 60 percent slopes	211	34F—Winfall gravelly loam, 30 to 50 percent slopes	265
27D—Wildgen gravelly loam, dry, 4 to 15 percent slopes	263	35C—McCollum fine sandy loam, 4 to 8 percent slopes	167
27E—Wildgen gravelly loam, dry, 15 to 30 percent slopes	263	35E—Courville gravelly silt loam, 8 to 30 percent slopes	90
27F—Wildgen gravelly loam, dry, 30 to 50 percent slopes	263	35F—Courville gravelly silt loam, 30 to 50 percent slopes	90
28B—Bemishave loam, 0 to 4 percent slopes ...	52	36D—Rumblecreek gravelly loam, 4 to 15 percent slopes	219
28E—Eaglewing gravelly loam, 8 to 30 percent slopes	101	36E—Rumblecreek gravelly loam, 15 to 30 percent slopes	220
28F—Eaglewing gravelly loam, 30 to 50 percent slopes	101	36F—Rumblecreek gravelly loam, 30 to 50 percent slopes	220
29E—Yourame gravelly loam, dry, 15 to 30 percent slopes	277	37D—Rumblecreek gravelly loam, dry, 4 to 15 percent slopes	221
29F—Yourame gravelly loam, dry, 30 to 50 percent slopes	277	37E—Rumblecreek gravelly loam, dry, 15 to 30 percent slopes	221
30E—Tevis gravelly loam, 15 to 35 percent slopes	246	37F—Rumblecreek gravelly loam, dry, 30 to 50 percent slopes	221
30F—Tevis gravelly loam, 35 to 60 percent slopes	246	39F—Beeskove gravelly loam, 35 to 60 percent slopes	47
30G—Tevis-Rubble land complex, 40 to 70 percent slopes	246	40E—Holloway gravelly silt loam, 15 to 35 percent slopes	131
31E—Tevis gravelly loam, dry, 15 to 35 percent slopes	247	40F—Holloway gravelly silt loam, 35 to 60 percent slopes	132
31F—Tevis gravelly loam, dry, 35 to 60 percent slopes	247	40G—Holloway-Rubble land complex, 40 to 70 percent slopes	132
32E—Mitten gravelly silt loam, 15 to 35 percent slopes	182		

41B—Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes	197	48E—Ashworth gravelly silt loam, 8 to 30 percent slopes	33
41C—Sacheen loamy fine sand, 2 to 8 percent slopes	223	48F—Ashworth gravelly silt loam, 30 to 50 percent slopes	34
41E—Sacheen loamy fine sand, 8 to 30 percent slopes	224	50B—Bigarm gravelly loam, 2 to 8 percent slopes	57
41F—Sacheen loamy fine sand, 30 to 60 percent slopes	224	50D—Bigarm gravelly loam, 8 to 15 percent slopes	57
42B—Selon fine sandy loam, 0 to 4 percent slopes	228	50E—Bigarm gravelly loam, 15 to 30 percent slopes	58
42D—Selon fine sandy loam, 4 to 15 percent slopes	228	50F—Bigarm cobbly loam, 30 to 60 percent slopes	58
42E—Holloway gravelly silt loam, cool, 15 to 35 percent slopes	132	51A—Horseplains-Riverwash complex, 0 to 2 percent slopes	136
42F—Holloway gravelly silt loam, cool, 35 to 60 percent slopes	133	52D—Bigarm gravelly loam, cool, 4 to 15 percent slopes	58
42G—Holloway, cool-Rock outcrop complex, 40 to 70 percent slopes	133	52E—Bigarm gravelly loam, cool, 15 to 30 percent slopes	59
43E—Waldbillig gravelly silt loam, 8 to 30 percent slopes	254	52F—Bigarm cobbly loam, cool, 30 to 60 percent slopes	59
44D—Waldbillig gravelly silt loam, cool, 4 to 15 percent slopes	255	53F—Hogsby-Rubble land-Rock outcrop complex, 15 to 60 percent slopes	129
45D—Phillcher gravelly silt loam, 8 to 30 percent slopes	202	54C—Yellowbay gravelly loam, 2 to 8 percent slopes	273
45G—Phillcher-Rock outcrop complex, 40 to 70 percent slopes	202	54E—Finleypoint gravelly loam, 15 to 30 percent slopes	110
46F—Felan gravelly silt loam, 35 to 60 percent slopes	106	54F—Finleypoint gravelly loam, 30 to 60 percent slopes	111
47C—Elkrock cobbly silt loam, 2 to 6 percent slopes, stony	102	55B—Yourame gravelly loam, 0 to 4 percent slopes	277
47D—Elkrock gravelly silt loam, 4 to 15 percent slopes	102	55D—Niarada gravelly loam, 4 to 15 percent slopes	192
47E—Petty gravelly loam, 8 to 30 percent slopes	200	55E—Niarada gravelly loam, 15 to 30 percent slopes	192
47F—Petty gravelly loam, 30 to 50 percent slopes	200	55F—Niarada gravelly loam, 30 to 60 percent slopes	193
47G—Petty-Rubble land complex, 40 to 70 percent slopes	201	56A—Bowlake gravelly loam, 0 to 2 percent slopes	79
48C—Ashworth gravelly silt loam, 2 to 8 percent slopes	33	56B—Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes	79

57D—Minesinger gravelly loam, 4 to 15 percent slopes	179	64E—Finleypoint gravelly loam, moist, 15 to 30 percent slopes	111
57E—Minesinger stony loam, 15 to 30 percent slopes	179	64F—Finleypoint gravelly loam, moist, 30 to 60 percent slopes	111
58B—McDonald silt loam, 2 to 8 percent slopes	170	65A—Larchpoint silt loam, 0 to 2 percent slopes	153
58D—McDonald silt loam, 8 to 15 percent slopes	170	66A—Bigbeaver silt loam, 0 to 2 percent slopes	66
58E—McDonald silt loam, 15 to 30 percent slopes	171	66F—Battlebutte gravelly loam, 30 to 60 percent slopes	41
58F—Waldbillig gravelly silt loam, moist, 30 to 50 percent slopes	255	67A—Glaciercreek gravelly silt loam, cool, 0 to 2 percent slopes	119
59D—Minesinger stony loam, cool, 4 to 15 percent slopes	180	67C—Glaciercreek gravelly silt loam, cool, 2 to 8 percent slopes	120
59E—Minesinger stony loam, cool, 15 to 30 percent slopes	180	67D—Koyokee gravelly loam, 4 to 15 percent slopes	147
59F—Minesinger stony loam, cool, 30 to 50 percent slopes	180	67E—Koyokee gravelly loam, 15 to 30 percent slopes	148
60B—Bonnash gravelly silt loam, 0 to 4 percent slopes	77	68C—Upsata gravelly silt loam, 2 to 8 percent slopes	250
60D—Niarada gravelly loam, cool, 4 to 15 percent slopes	193	68E—Upsata gravelly silt loam, 8 to 30 percent slopes	250
60E—Niarada gravelly loam, cool, 15 to 30 percent slopes	193	68F—Upsata gravelly silt loam, 30 to 60 percent slopes	251
60F—Niarada gravelly loam, cool, 30 to 60 percent slopes	194	69B—Meadowpass gravelly loam, 2 to 8 percent slopes	174
61B—Scotmont fine sandy loam, 0 to 4 percent slopes	227	69C—Tamarack loam, 2 to 8 percent slopes ...	242
61D—Scotmont fine sandy loam, 4 to 15 percent slopes	227	70B—Half Moon silt loam, 2 to 8 percent slopes	124
61F—Flott gravelly loam, 30 to 50 percent slopes	114	70D—Half Moon silt loam, 8 to 15 percent slopes	124
62B—Beaverdump gravelly loam, 0 to 4 percent slopes	45	70E—Half Moon silt loam, 15 to 30 percent slopes	124
62D—Beaverdump gravelly loam, 4 to 15 percent slopes	46	71D—Loonlake gravelly silt loam, 4 to 15 percent slopes	163
62F—Flott gravelly loam, dry, 30 to 50 percent slopes	114	71E—Loonlake gravelly silt loam, 15 to 30 percent slopes	163
64B—Lionwood loam, 0 to 4 percent slopes ...	156	72A—Blacklake mucky peat, 0 to 1 percent slopes	74

72B—Millpocket silty clay loam, 2 to 8 percent slopes	178	84F—Lozeau gravelly loam, 30 to 50 percent slopes	165
73A—Meadowpeak silt loam, 0 to 2 percent slopes	175	85A—Hogheaven silt loam, 0 to 2 percent slopes	128
74A—Blackcreek silt loam, 0 to 2 percent slopes	72	85B—Whitepine silt loam, 0 to 4 percent slopes	260
75B—Tallcreek silt loam, 0 to 4 percent slopes	241	85D—Whitepine silt loam, 4 to 15 percent slopes	260
76E—Felan gravelly silt loam, moist, 15 to 35 percent slopes	106	86C—Bata gravelly silt loam, 2 to 8 percent slopes	40
76F—Felan gravelly silt loam, moist, 35 to 60 percent slopes	106	86E—Bata gravelly silt loam, 8 to 30 percent slopes	40
77D—Beeskove gravelly loam, moist, 4 to 15 percent slopes	48	87E—Pashua gravelly loam, 8 to 30 percent slopes	199
77E—Beeskove gravelly loam, moist, 15 to 35 percent slopes	48	87F—Stevie gravelly silt loam, 35 to 60 percent slopes	239
77F—Beeskove gravelly loam, moist, 35 to 60 percent slopes	48	88C—Dewberry silt loam, 2 to 8 percent slopes	93
78B—Fernline silt loam, 0 to 4 percent slopes	108	88E—Dewberry gravelly silt loam, 8 to 45 percent slopes	94
78D—Fernline silt loam, 4 to 15 percent slopes	108	89B—Iffgulch clay, 0 to 4 percent slopes	140
80F—Sharrott-Rubble land-Rock outcrop complex, 15 to 60 percent slopes	234	89E—Selway gravelly sandy loam, 8 to 30 percent slopes	233
81E—Noxlin silt loam, 8 to 35 percent slopes, stony	195	90A—Camascreek silt loam, 0 to 2 percent slopes	83
82B—Bignell gravelly loam, 0 to 4 percent slopes	71	91B—Biglake gravelly loam, 0 to 8 percent slopes	69
82D—Bignell gravelly loam, 4 to 15 percent slopes	71	91D—Stargulch very fine sandy loam, 4 to 15 percent slopes	237
82E—Bignell gravelly loam, 15 to 35 percent slopes	71	92C—Oldtrail gravelly sandy loam, 0 to 8 percent slopes	197
82F—Sharrott, cool-Rock outcrop-Rubble land complex, 15 to 60 percent slopes	234	93A—Horseplains fine sandy loam, 0 to 2 percent slopes	137
83B—Backroad gravelly silt loam, 0 to 4 percent slopes	37	94A—Revais silt loam, 0 to 2 percent slopes	212
83D—Backroad gravelly silt loam, 4 to 15 percent slopes	37	94D—Berray silt loam, 4 to 15 percent slopes	56
84E—Lozeau gravelly loam, 8 to 30 percent slopes	164	95A—Gardencreek silty clay loam, 0 to 2 percent slopes	115

96A—Clearcreek silt loam, 0 to 2 percent slopes	84	117E—Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes	145
96D—Courvash cobbly silt loam, 4 to 15 percent slopes	88	118B—Dryfork-Selow silt loams, 0 to 4 percent slopes	96
96E—Courvash cobbly silt loam, 15 to 35 percent slopes	88	118D—Dryfork-Kerrdam silt loams, 4 to 15 percent slopes	97
97C—Remount very gravelly loam, 2 to 12 percent slopes	208	119E—Vincom-Lonepine silt loams, 15 to 35 percent slopes	253
97E—Remount very gravelly loam, 12 to 25 percent slopes	208	119F—Vincom-Lake sediment outcrop complex, 35 to 60 percent slopes	253
97F—Mollman gravelly loam, 30 to 50 percent slopes	188	120G—Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes	270
98C—Doglake extremely cobbly loam, 2 to 12 percent slopes	95	122E—Winkler, cool-Sharrott, cool-Rock outcrop complex, 8 to 40 percent slopes	270
98E—Bendahl gravelly silt loam, 15 to 30 percent slopes	54	122G—Winkler, cool-Sharrott, cool-Rubble land complex, 40 to 85 percent slopes	271
98F—Bendahl gravelly silt loam, 30 to 50 percent slopes	54	123D—Yourame-Wildgen gravelly loams, 8 to 30 percent slopes	278
99A—McLangor-Meadowpeak complex, 0 to 2 percent slopes	172	123E—Mocmont-Winkler complex, 8 to 35 percent slopes	185
99C—Lesier gravelly silt loam, 2 to 8 percent slopes	154	126G—Repp-Rock outcrop complex, 40 to 70 percent slopes	211
99E—Lesier gravelly silt loam, 8 to 30 percent slopes	154	132F—Mitten-Tevis complex, 35 to 60 percent slopes	183
100—Rock outcrop-Rubble land complex	213	134E—Winfall-Courville complex, 8 to 30 percent slopes	265
103B—Gird-McCollum complex, 0 to 4 percent slopes	117	138E—Winfall-Courville complex, dry, 8 to 30 percent slopes	266
105B—Whitearth-Slickspots complex, 2 to 8 percent slopes	259	143E—Waldbillig-Holloway gravelly silt loams, 8 to 30 percent slopes	255
106D—Sacheen-Dune land complex, 4 to 15 percent slopes	225	143F—Holloway-Waldbillig gravelly silt loams, 30 to 50 percent slopes	134
112A—Marklepass-Slickspots complex, 0 to 4 percent slopes	166	144E—Waldbillig-Holloway gravelly silt loams, cool, 8 to 30 percent slopes	256
113D—Round Butte-Irvine silty clay loams, 4 to 15 percent slopes	217	144F—Holloway-Waldbillig gravelly silt loams, cool, 30 to 50 percent slopes	134
116E—Irvine-Round Butte silty clay loams, 8 to 35 percent slopes	141	148C—Bigarm gravelly loam, cool, 2 to 8 percent slopes, very stony	59
116F—Irvine-Lake sediment outcrop complex, 35 to 60 percent slopes	142		

148E—Bigarm gravelly loam, cool, 8 to 25 percent slopes, very stony	60	250E—Bigarm-Rubble land complex, 15 to 30 percent slopes	62
150E—Bigarm-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	60	250F—Bigarm-Rubble land complex, 30 to 60 percent slopes	63
150F—Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	61	251A—Horseplains fine sandy loam, gravelly substratum, 0 to 2 percent slopes	137
151A—Revais silt loam, gravelly substratum, 0 to 2 percent slopes	213	252E—Bigarm, cool-Rubble land complex, 15 to 30 percent slopes	63
152E—Bigarm, cool-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	61	252F—Bigarm, cool-Rubble land complex, 30 to 60 percent slopes	64
152F—Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	62	254F—Finleypoint-Rubble land complex, 30 to 60 percent slopes	112
153F—Hogsby-Finleypoint-Rock outcrop complex, 30 to 60 percent slopes	130	261C—Gird-McCollum complex, 4 to 8 percent slopes	118
166E—Battlebutte-Bigdraw-Welded tuff outcrop complex, 15 to 30 percent slopes	42	266E—Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes	43
166F—Battlebutte-Welded tuff outcrop complex, 30 to 60 percent slopes	42	291B—Half Moon silt loam, cool, 2 to 8 percent slopes	125
168D—Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes	68	291D—Half Moon silt loam, cool, 8 to 15 percent slopes	125
197C—Remount-Bowlake complex, 2 to 12 percent slopes	209	291E—Half Moon silt loam, cool, 15 to 35 percent slopes	125
200—Riverwash	213	291F—Half Moon silt loam, cool, 35 to 60 percent slopes	126
211G—Combest-Rubble land complex, 40 to 70 percent slopes	86	292B—McCollum fine sandy loam, 0 to 4 percent slopes	168
213A—Round Butte-Selow complex, 0 to 2 percent slopes	218	322E—Holloway gravelly silt loam, moist, 15 to 35 percent slopes	135
213B—Round Butte-Selow complex, 2 to 8 percent slopes	218	322F—Holloway gravelly silt loam, moist, 35 to 60 percent slopes	135
215B—Lonepine-Round Butte complex, 2 to 8 percent slopes	161	323G—Holloway, moist-Rock outcrop complex, 40 to 70 percent slopes	135
217E—Kerrdam-Round Butte-Irvine complex, 8 to 35 percent slopes	146	341C—Krause very cobbly silt loam, 2 to 8 percent slopes	149
218D—Dryfork-Selow silt loams, 4 to 15 percent slopes	97	350B—Bigarm gravelly loam, alluvial, 2 to 8 percent slopes	64
221F—Courville-Rockhill-Rock outcrop complex, 30 to 50 percent slopes	90	350D—Bigarm gravelly loam, alluvial, 8 to 15 percent slopes	64
222F—Courville gravelly silt loam, dry, 30 to 50 percent slopes	91	350E—Bigarm gravelly loam, alluvial, 15 to 30 percent slopes	65

350F—Bigarm gravelly loam, alluvial, 30 to 50 percent slopes	65	522F—Winfall-Courville complex, 30 to 60 percent slopes	266
351C—McCollum-Belton fine sandy loams, 4 to 8 percent slopes	168	532E—Winkler-Sharrott-Rock outcrop complex, 8 to 40 percent slopes	271
351D—McCollum-Belton fine sandy loams, 8 to 15 percent slopes	169	541C—Yellowbay gravelly loam, moist, 2 to 8 percent slopes	273
366E—Battlebutte-Bigdraw gravelly loams, moist, 8 to 30 percent slopes	43	542F—Yellowbay-Selon-Bemishave complex, 15 to 60 percent slopes	273
366F—Battlebutte-Bigdraw gravelly loams, moist, 30 to 60 percent slopes	44	543F—Yellowbay-Selon-Sacheen complex, 15 to 60 percent slopes	274
374F—Mitten-Rock outcrop complex, 40 to 70 percent slopes	184	582E—Waldbillig-Holloway gravelly silt loams, moist, 15 to 30 percent slopes	256
392D—Rumblecreek gravelly loam, 8 to 15 percent slopes, stony	222	582F—Waldbillig-Holloway gravelly silt loams, moist, 30 to 50 percent slopes	257
392E—Rumblecreek gravelly loam, 15 to 30 percent slopes, stony	222	631E—Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes	214
411E—Sacheen-Rock outcrop complex, 8 to 30 percent slopes	225	632F—Rockhill-Rock outcrop complex, 15 to 60 percent slopes	215
421B—Selon fine sandy loam, moist, 0 to 4 percent slopes	229	641D—Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes	156
421D—Selon fine sandy loam, moist, 4 to 15 percent slopes	229	641E—Lionwood-Scotmont-Whitepine complex, 15 to 35 percent slopes	157
421E—Selon fine sandy loam, moist, 15 to 30 percent slopes	230	671C—Glaciercreek gravelly silt loam, 2 to 8 percent slopes	120
422F—Selon-Bemishave complex, 15 to 60 percent slopes	230	671E—Glaciercreek gravelly silt loam, 8 to 30 percent slopes	120
441F—Tevis-Rock outcrop complex, 30 to 60 percent slopes	247	691B—Tamarack-Crystalex complex, 0 to 4 percent slopes	242
471D—Elkrock cobbly silt loam, 4 to 15 percent slopes, extremely bouldery	103	691D—Tamarack-Crystalex complex, 4 to 15 percent slopes	243
472B—Elkrock gravelly silt loam, moist, 0 to 4 percent slopes	103	691E—Tamarack-Crystalex complex, 15 to 30 percent slopes	243
472D—Elkrock gravelly silt loam, moist, 4 to 15 percent slopes	104	691F—Tamarack-Crystalex complex, 30 to 60 percent slopes	244
472F—Elkrock gravelly silt loam, moist, 30 to 60 percent slopes	104	692B—Tamarack fine sandy loam, 0 to 4 percent slopes	244
473D—Elkrock-Selon complex, 4 to 15 percent slopes	104	731A—Meadowpeak-Firetower silt loams, 0 to 2 percent slopes	176
513A—Sonyok silty clay loam, 0 to 4 percent slopes	236	732A—Meadowpeak silt loam, 0 to 2 percent slopes, frequently flooded	176

771G—Beeskove-Mollman-Rock outcrop complex, 40 to 80 percent slopes	49	860E—Bonnash gravelly silt loam, 15 to 35 percent slopes	78
781D—Fernline-Cabinet silt loams, 4 to 15 percent slopes	108	862E—Beaverdump gravelly loam, 15 to 35 percent slopes	46
781E—Fernline-Cabinet silt loams, 15 to 30 percent slopes	109	867E—Glaciercreek gravelly silt loam, cool, 8 to 30 percent slopes	121
791B—Redlock-Fernline silt loams, 0 to 4 percent slopes	205	867F—Glaciercreek gravelly silt loam, cool, 30 to 45 percent slopes	121
791D—Redlock-Fernline silt loams, 4 to 15 percent slopes	205	871G—Stevie-Rock outcrop complex, 40 to 70 percent slopes	239
791E—Redlock-Fernline silt loams, 15 to 35 percent slopes	206	884E—Loneman silt loam, 15 to 35 percent slopes	159
792D—Redlock-Fernline-Iffgulch complex, 0 to 15 percent slopes	206	884F—Loneman silt loam, 35 to 60 percent slopes	159
807A—McLangor mucky peat, 0 to 2 percent slopes	173	887E—Stevie gravelly silt loam, 15 to 35 percent slopes	239
808A—Barzee mucky peat, 0 to 2 percent slopes	38	891B—Stargulch very fine sandy loam, 0 to 4 percent slopes	237
811D—Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony	195	893A—Bigbeaver silt loam, 0 to 2 percent slopes, frequently flooded	67
821D—Combest gravelly silt loam, 4 to 15 percent slopes	86	895A—Ibex silt loam, 0 to 2 percent slopes	139
824E—Dubay silt loam, 15 to 30 percent slopes	99	897C—Mollman gravelly loam, 2 to 8 percent slopes	188
834F—Krause gravelly silt loam, 15 to 45 percent slopes	150	897E—Mollman gravelly loam, 8 to 30 percent slopes	188
842E—Selon fine sandy loam, 15 to 30 percent slopes	230	971E—Mollman gravelly loam, dry, 15 to 30 percent slopes	189
842F—Selon fine sandy loam, 30 to 60 percent slopes	231	971F—Mollman gravelly loam, dry, 30 to 50 percent slopes	189
858E—Waldbillig gravelly silt loam, moist, 8 to 30 percent slopes	257	DA—Denied access	92
860D—Bonnash gravelly silt loam, 4 to 15 percent slopes	78	DAM—Dam	92
		W—Water	258

Summary of Tables

Temperature and precipitation	12
Freeze dates in spring and fall	14
Growing season	15

For tables with the most current data, please visit the
Soil Data Mart at <http://soildatamart.nrcs.usda.gov/>.

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Dave White
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Soil Survey of Sanders and Parts of Lincoln and Flathead Counties, Montana

Fieldwork by Michael J. Hansen, Calvin R. Sibley, Gregory L. Snell, David J. Trochlell, and Thomas J. Weber, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
United States Department of the Interior, Bureau of Indian Affairs, and
Montana Agricultural Experiment Station

The SANDERS AND PARTS OF LINCOLN AND FLATHEAD COUNTIES soil survey is located in northwestern Montana (fig. 1). The survey area has a total of 945,500 acres, or 1,477 square miles. It is characterized by steep mountain ranges, foothill areas, and narrow to broad mountain valleys.

The elevation ranges from 2,175 feet at the Clark Fork River near the Cabinet Gorge Dam to 7,996 feet at Squaw Peak.

Precipitation ranges from 10 inches along the Little Bitterroot River to over 50 inches in the mountains. Typically, winters are long and cool; springs and falls are moist; and summers are hot and dry.

Native vegetation of the drier valleys and foothill areas is bunchgrass prairie species. The moister western valley areas are forested with mixed coniferous and deciduous tree species, especially along major drainages. Vegetation of mountainous areas consists of coniferous forest habitat types, varying from dry ponderosa pine types to moist western red cedar and western hemlock types.

About 65 percent of the survey area is forestland while 30 percent is range and pasture. The remaining 5 percent is cropland.

The major population centers include Dixon, Heron, Hot Springs, Noxon, Paradise, Plains, Thompson Falls, and Trout Creek. Thompson Falls is the Sanders County seat. State Highways 200, 135, 28, and 56 are the major arteries, routed mainly along the Clark Fork and Flathead Rivers.

The major industries include agriculture, mining, timber, and service industries.

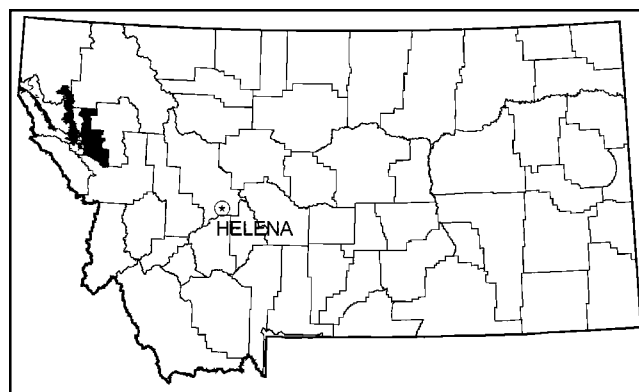


Figure 1.—Location of Sanders and Parts of Lincoln and Flathead Counties, Montana

General Nature of the Survey Area

This section describes some of the environmental and cultural features that affect the use and management of soils in the survey area. These features are history; industry, transportation, and recreation; physiography, drainage, and geology; mineral and ground-water resources; and climate.

History

The earliest known inhabitants within the survey area were bands of Native Americans of the Pend d'Oreille and Salish tribes living along the major rivers. These bands used the rivers and their

associated valleys as transportation and trade routes. The topography of the area enabled the tribes to cross east of the Continental Divide to hunt buffalo on the plains.

European habitation in the area began in 1809 with the establishment of Salish House, a trading post and fort, by David Thompson of the Northwest Fur Company. Salish House was located along the Clark Fork River about 8 miles upstream from present-day Thompson Falls. Later, another Northwest Fur Company employee, Jocko Finley, set up a camp along the Bull River and established trade with tribes along the Flathead River.

By 1847, Angus McDonald, a trader for the Hudson Bay Company, established Fort Connah in Mission Valley to capitalize on the fur trade in the area of the present-day Flathead Indian Reservation. Fort Connah was the last Hudson Bay Company post built in the United States. The fort remained active until 1871, when a declining fur industry and the discovery of gold in the Deer Lodge Valley brought an end to business.

On July 16, 1855, Governor Stevens signed the Hellgate Treaty with leaders of the Salish, Pend d'Oreille, and Kootenai tribes to establish the Flathead Indian Reservation.

The arrival of the Great Northern Railroad in 1883 accelerated settlement and spurred development of mining, creating towns including Heron, Trout Creek, and Vermilion. The development of mining created an increasing demand for timber products. Lumber mills were built to meet the demand. The timber industry later replaced mining as the major economic activity of the region.

Sanders County was established on February 7, 1905 from part of Missoula County. The county was named after U.S. Senator William F. Sanders.

In 1910, the government opened the Flathead Indian Reservation to white homesteaders, who flocked to the area to stake land claims. The late 1920s brought years of drought, high interest rates, and low farm prices, which caused foreclosure of many farms. To offset this trend, the government accelerated construction of irrigation projects that brought higher, consistent agricultural yields and electricity throughout the reservation.

A series of dams, beginning with the one at Thompson Falls, were constructed along the lower Clark Fork River for power generation and flood control.

Industry, Transportation, and Recreation

The agricultural, mining, and timber industries continue to be very important to the economy of the survey area. In addition, small businesses catering to local populations and recreationists are helping to create a more stable, diversified local economy.

Plains and Thompson Falls are the two major retail centers and markets serving Sanders County and the surrounding area. Smaller towns such as Dixon, Heron, Hot Springs, Noxon, Paradise, and Trout Creek have varying degrees of services and markets.

Agriculture, lumber production, and recreation are the main industries. Cedar, fir, pine, and western larch (locally called tamarack) are harvested for dimension lumber, house logs, plywood, and posts and poles.

Agriculture caters to both traditional and specialty markets. Farm-ranch combinations produce livestock—cattle, horses, and sheep—and grains—barley, oats, and wheat—and hay. Nontraditional crops include bluegrass lawn seed, mint, and ornamental flowers that are preserved and sold to florists.

Major roads crossing the survey area include U.S. Highway 2 and State Highway 200, both of which run east to west. Local highways include State Highway 28, running northeast to southwest through the Flathead Indian Reservation; State Highway 56, running north to south along the Bull River; and State Highway 135, running northeast to southwest along the Clark Fork River. The county road and old ACM (Anaconda Copper Mining Company) road parallel the Thompson River from State Highway 200 to U.S. Highway 2. An extensive network of gravel roads and logging roads provide corridors through the area.

Montana Rail Link runs southeast to northwest. Small airports with asphalt runways are located in Plains and Thompson Falls, with numerous grassed runways located throughout the survey area on private property.

Outdoor recreational opportunities are varied and nearly unlimited in this corner of Montana. The Clark Fork, Flathead, and Thompson Rivers are popular for boating, fishing, rafting, water-skiing, and wildlife viewing. The surrounding mountains provide opportunities for camping, cross-country skiing, hiking, hunting, and snowmobiling. Several dude ranches and outfitting-guide services are located within the survey area. In addition, the valleys are

dotted with vacation or retirement homes for people from all over the country.

Physiography, Drainage, and Geology

Marie Marshall Garsjo, Montana State Geologist, Natural Resources Conservation Service, prepared this section.

The survey area lies west of the Continental Divide in the northern Rocky Mountain physiographic province, within the structural province of the Rocky Mountain Fold-Thrust Belt.

The survey area contains portions of four mountain ranges, all of which trend northwest to southeast. The ranges include the Cabinet Mountains in the northern portion; the Salish Mountains, mostly contained within the Flathead Indian Reservation in the northeastern corner; the Bitterroot Range along the southwestern border, forming the Montana-Idaho state line; and the Coeur d'Alene Mountains in the southern portion, splitting off from the Bitterroot Range and forming the boundary between Sanders and Mineral Counties.

The survey area is characterized by rugged, mountainous terrain that is drained by the Flathead and Thompson Rivers and the Clark Fork of the Columbia River. Most of the major valleys are flat and wide, but portions of the Clark Fork River and most of the major tributaries are narrow and deeply incised. The Cabinet Mountains were sculpted by glaciers and, in general, are higher and more rugged than the surrounding mountains. Southeast of the Vermilion River, the mountain topography is less rugged, and in the Thompson River drainage, it is even more subdued. The Bitterroot Range is lower and less rugged than the Cabinet Mountains and shows less evidence of glaciation. The Salish Mountains to the east consist of a series of low, rolling hills.

Approximately one-half of Sanders County is included in the survey area, including most of the county's eastern half and the lower-elevation valley of the Clark Fork River corridor that extends up the river from Heron, near the Idaho border, to Dixon, near the county's eastern border. The survey area also includes 57,000 acres in southeastern Lincoln County and 45,400 acres in southwestern Flathead County. The portion of the Flathead Indian Reservation located in Sanders County was also included in this survey area. Most of the mountainous areas in the western portion of Sanders County were not included in this survey, including all U.S. Forest Service lands and the Cabinet Mountain Wilderness.

Elevations range from approximately 2,175 feet (663 meters) above sea level, just downstream of the town of Heron, to 7,996 feet (2,437 meters) at Squaw Peak in the Coeur d'Alene Mountains. The highest peaks in the survey area are located in the Cabinet Mountain Wilderness, with elevations between 7,500 and 8,700 feet (2,290 and 2,650 meters).

Numerous waterways in the western and central portions of the survey area drain the Bitterroot Range and the Coeur d'Alene Mountains into the Clark Fork River. The Flathead River drains the eastern portion of the survey area then flows into the Clark Fork River just above the town of Paradise.

Three reservoirs that impact this survey area have been constructed on the Clark Fork River. In Idaho near the Montana border, the Cabinet Gorge Reservoir impounds water as far upstream as the town of Noxon. Just upstream from Noxon, the Noxon Rapids Dam impounds water up to the Thompson Falls Golf Course. The Thompson Falls Dam impounds water from the town of Thompson Falls almost to Weeksville.

The geologic history of the survey area began in the Precambrian Era, approximately 1.5 billion-years ago (bya), with the deposition of a very thick sequence of sedimentary rocks known as the Belt Supergroup. Vast amounts of sediment were deposited because vegetation had not yet developed on the continents to prevent erosion. Sandstone, shale, siltstone, and minor amounts of limestone were deposited into a long, narrow basin that contained exposed mudflats; small beaches; and shallow, probably brackish, water. Sandstone was deposited on beach and near-shore environments; shale and siltstone were deposited in lower energy, deep-water environments; and limestone was normally formed in warm, shallow water.

As sediments accumulated, the basin subsided. Some estimates place the total thickness of Belt rocks at a minimum of 60,000 feet (18.3 kilometers) (Harrison, Griggs, and Wells, 1986). Over time, the sediments were metamorphosed by pressure caused by the great weight of accumulated sediments and increased temperatures caused by regional volcanic activity. Sandstone was metamorphosed to quartzite, shale to argillite, and siltstone to siltite.

Three episodes of volcanic activity during this time resulted in the intrusion of dikes and sills between sedimentary beds of the Belt rocks. The dikes cut across bedding planes, and the sills intruded between sedimentary beds. Both dikes and sills occur in narrow bands up to a mile wide. The sills extend along bedding planes for miles and are prevalent in

the mountains south and southwest of Camas Prairie. Mineral deposits associated with these igneous bodies include ores of copper, gold, lead, silver, and zinc.

Belt sedimentation ended with an orogeny, or mountain-building episode, that occurred about 800-million years ago (mya). During this orogeny, the Belt basin was gently folded and faulted. Some of the major structural features present today were formed at this time.

During the Cambrian Period (570 to 505 mya), sedimentary rocks were unconformably deposited upon older Belt rocks as the ocean rose and the coastline moved to the east.

Where much of Montana was above sea level, erosion occurred over long periods and created disconformities, or gaps, in the geologic record. In the survey area, the disconformity extends from the late-Cambrian Period to the Cretaceous Period, approximately 120-million years ago.

Many of the prominent structural features that are visible today began forming in the Cretaceous Period. At that time, a collision between major crustal plates to the west created compressional forces that formed the Rocky Mountains. This regional northeastern-southwestern compression resulted in large-scale folds and faults that trend northwest to southeast. Relatively thin sheets of Belt rocks were thrust up over younger sedimentary rocks in a series of imbricate, or overlapping, faults. Numerous, closely spaced thrust faults with minor displacement are associated with the large-scale faults. Some of the thrust planes were subsequently folded, overturned, and faulted again.

All of the Precambrian-aged bedrock in the survey area was moved into the area on these thrust sheets. The displacement has been estimated to be at least 50 miles (80 kilometers) from the west. Major faults include the Lewis and Clark Line, which extends from Coeur d'Alene, Idaho, southeast to Helena, Montana, and the Hope Fault Zone, which extends up the Clark Fork Valley from Noxon through Thompson Falls to Olson Peak, 6 miles (10 kilometers) northeast of Saint Regis. Blue Slide, visible from Finley Flats a few miles downstream of Thompson Falls, is located along the Hope Fault Zone. At Olson Peak, the Hope Fault Zone splits into the Ninemile and Saint Mary's Faults. The Ninemile Fault extends to the southeast through the Clark Fork Valley for approximately 10 miles (16 kilometers) then across the mountains to Frenchtown. The Saint Mary's Fault extends eastward from the Olson Peak area up the Flathead River to Ravalli where it splits into several smaller faults.

The survey area includes several other major thrust faults that extend to the northwest from the Lewis and Clark Line. This line of faults is considered to reflect some deep crustal flaw formed in the Precambrian Era that has been reactivated intermittently throughout geologic time.

During the Cretaceous orogeny, deep-seated melting created masses of magma that rose into the upper crust. As it rose, it deformed the surrounding sedimentary formations; lubricated planes of thrust faulting; and, in many areas, mineralized the surrounding rock. Some of the magma rose to the surface, forming extrusive as well as intrusive igneous rocks in western Montana. Many of the plutons are located along or near high-angle faults, and most appear to intrude through, or at least into, thrust plates.

A zone of intrusions extends north-northeast along the Lewis and Clark Line from Wallace, Idaho, to the northeastern side of the Clark Fork Valley near Trout Creek, Montana. Radiometric dating has been performed on some of these intrusions, and their ages range from about 120- to 35-million years (Marvin and others, 1984). Hydrothermal activity, occurring as these intrusions cooled, formed a variety of mineral deposits and created the rich mining districts of Idaho and western Montana.

Two major Cretaceous-aged intrusions occur in the survey area. One is located across the Clark Fork River from Trout Creek at the mouth of the Vermilion River. The other is located in the area between Beaver and Little Beaver Creeks, southwest of the town of White Pine.

Mountain building continued into the Tertiary Period (66 to 1.6 mya) when volcanism and erosion of the newly formed Rocky Mountains created extensive basin-fill deposits. As the surrounding mountains were uplifted, great volumes of sediment were washed into the valleys. Volcanic eruptions to the west blanketed the survey area with volcanic ash that also was washed into the valleys.

Tertiary-aged volcanic rocks deposited during the Oligocene Epoch (37 to 24 mya) are exposed in the Hog Heaven Volcanic Field. It is located at the northern end of the Little Bitterroot Valley and occupies an area of approximately 20 square miles (50 square kilometers). The Hog Heaven Mining District is associated with this volcanic field.

The Quaternary Period (1.6 mya to present) has been dominated by periods of glaciation, volcanism, and continuing erosion and deposition. The landscape of the survey area has been extensively altered by glaciation. Alpine glaciers have covered

the high peaks of the Bitterroot Range and the Cabinet and Coeur d'Alene Mountains. These glaciers eroded jagged ridges and U-shaped valleys and deposited linear moraines and glacial outwash in many valleys. Ice advances from large continental ice sheets to the north have significantly affected the topography in the lower elevations.

Many of the soils in the survey area have distinctive pale layers of volcanic ash originating from volcanic eruptions in the Cascade Range. Glacier Peak in the northern Washington Cascade Range erupted approximately 12,000 years ago. Ash from this eruption spread to the east and southeast in an elliptical pattern, covering western Montana from Flathead Lake south to the Salmon River Mountains in Idaho. Mount Mazama, now Crater Lake, in the southern Oregon Cascade Range erupted less than 7,000 years ago. Ash from this eruption spread over the area between northern Nevada and southwestern Alberta; this area includes western Montana.

Today, streams and rivers are actively reworking the alluvial deposits in the existing flood plains. These flood plains are subject to overflow from fluctuating water levels caused by spring runoff. Alluvial terraces at higher elevations along the valley floors show former river levels. These older terraces are no longer undergoing active deposition and are relatively stable. The northeastern portion of the Plains Valley contains a large stream terrace that is composed of glacial lakebed sediments.

Vast continental glaciers have advanced and retreated from northern Canada many times during the Pleistocene Epoch (1.6-million to 10,000 years ago). Four separate ice advances have been identified. During the last ice advance, approximately 15,000 years ago, the glaciers were at their maximum extent. During this time, the final advance of the Cordilleran Ice Sheet, which covered most of the Canadian Rocky Mountains, significantly affected the topographic features in the survey area. One lobe overrode the Salish Mountains to the northeast and advanced down the Bull River and Thompson River drainages to the west. Another huge lobe advanced from the Purcell Valley in British Columbia south through what is now Sand Point, Idaho, and up the Clark Fork Valley in Montana.

This huge lobe created a large ice dam at the present site of Lake Pend Oreille, located in Idaho, less than 20 miles (32 kilometers) from the Idaho-Montana border. This ice dam was 2,000-feet (610-meters) high, and the area behind it filled in by rising waters in the Clark Fork and Flathead Valleys. This

body of water has been named Glacial Lake Missoula, and it stretched from the ice dam east to the Drummond area and south as far as Darby. Everything in these drainages below an elevation of 4,300 feet (1,310 meters) above sea level was flooded. Lakebed deposits occur both in valley bottoms and high in the foothills. It is estimated that this ice dam breached and then refilled between 36 and 41 times. These old shorelines can be seen in a series of distinctive horizontal benches in the hills above Missoula.

As the water in Glacial Lake Missoula rose, the ice dam floated and eventually failed. As the lake drained, water, with an estimated output of 8 to 10 cubic miles of water per hour, poured out of the breach and down the Clark Fork Valley. The rapid drainage of this huge body of water scoured soil from valley walls, particularly in the narrower reaches of the Clark Fork Valley, and left distinctive and unusual deposits in the survey area. Rainbow Lake (also known as Dog Lake) was scoured out of bedrock as water flowed over the divide from the Little Bitterroot Valley toward Plains.

The unique flood deposits include the giant ripple marks in the Camas Prairie and Rainbow Lake areas. The ripple marks are composed of sand and gravel and are as large as 35-feet (11-meters) high, spaced 200 to 500 feet (60 to 150 meters) apart. Another unusual deposit was created by eddying water at the mouths of tributaries to the Clark Fork River. As the surging water in the tributaries tried to enter the main flow down the Clark Fork River, eddies were formed that dropped massive sand and gravel deposits in the mouths of the tributaries. These "valley plugs" look like small earthen dams and can be seen between Perma and Paradise and east of Thompson Falls. Today, sand and gravel are mined from these deposits.

After Glacial Lake Missoula drained, winds generated from the remaining ice blew sediment into dunes and small drift deposits. These deposits are particularly noticeable near Sloan Bridge along the Flathead River. In these aeolian deposits, the Dryfork, Kerrdam, and Selow soils are associated with silty deposits and the Sacheen soils are associated with sandy deposits.

The sequence of rocks exposed in the survey area is summarized below, listed in order of decreasing age. Formations are defined as a succession of strata distinctive enough to constitute a basic unit for mapping, identified by similar rock type and stratigraphic position. Formations can be combined

into groups or subdivided into members. Systems are the rocks deposited during a particular geologic period.

In many cases, outcrop areas for individual formations are small and difficult to differentiate in the field. In these cases, no soil series are correlated with the formation. In some cases, individual formations have not been correlated across broad areas so the formation names have not been formally recognized. These formations are not listed here.

Precambrian System (2.5 bya to 570 mya). The oldest rocks in the survey area belong to the Belt Supergroup. These rocks are commonly thinly bedded, and, because they were only lightly metamorphosed, many of their original sedimentary features, such as ripple marks and mud cracks, are well preserved.

The oldest unit within the Belt Supergroup is the Prichard Formation, which consists of thinly bedded black and gray argillite, gray siltite, with gray impure quartzite at the base of the formation. This formation is the most extensive within the Belt Supergroup, with an overall thickness of more than 20,000 feet (6 kilometers). It separates into thin slabs along bedding planes and is quarried between Paradise and Saint Regis for decorative stone.

The next youngest unit is the Ravalli Group, consisting of the Burke, Revett, and Saint Regis Formations. The Burke Formation consists of gray to purple siltite interbedded with lesser amounts of green to purple argillite. Tiny, perfectly formed octahedral crystals of magnetite are common in the siltites. Thicknesses range from 2,500 to 7,500 feet (760 to 2,290 meters).

The Revett Formation contains beds of white, tan, and purple streaked, blocky, crossbedded quartzite. Thicknesses vary from 2,000 feet (610 meters) in the western portion of the survey area to 500 feet (150 meters) near Flathead Lake.

The upper unit of the Ravalli Group is the Saint Regis Formation, which consists of an interbedded carbonate-bearing sequence of purple and dark-green argillite and siltite. Thicknesses range from 1,000 to 3,000 feet (305 to 915 meters).

In Flathead County and northeastern Sanders County, the Saint Regis Formation is designated as the Spokane Formation. The formations were deposited at the same time, in the same stratigraphic position at the top of the Ravalli Group, with similar rock types, but they were associated with different depositional environments, or facies. The Spokane Formation also consists of interbedded purple and dark-green argillite and siltite; however, it includes thin interbeds of white quartzite.

The Empire Formation occurs on the Flathead-Sanders county line and in the Flathead Lake area. This formation consists of thin, even beds of light- and dark-green argillite and siltite. It is consistent in its appearance where exposed; however, it does not occur in the western portion of the survey area.

A fairly thick and continuous calcareous sequence, known as the Middle Belt Carbonate, was deposited across the Belt basin approximately in the middle of the sequence of formations. Deposition across this broad area resulted in several different facies; therefore, there are several different formation names for this unit. In this area, the Wallace and Helena Formations represent the Middle Belt Carbonate.

The Wallace Formation varies in thickness and rock type more than any other formation in the survey area. Generally, it consists of finely laminated black and white argillite, green siltite, and minor beds of limestone and dolomite. Near Flathead Lake, this interval is represented by the Helena Formation, which consists of the same rock types as the Wallace Formation but with thicker and more abundant carbonate beds.

The Missoula Group is the youngest of the Belt Supergroup. This group contains rapid changes in rock type, both horizontally and vertically, and has been given different formation names in different areas. Because the nomenclature has not been finalized, it will not be broken into individual formations here. In the Coeur d'Alene Mountains, the rocks consist of thin-bedded reddish-purple and green argillite and quartzite.

Soils weathered from sedimentary rock on moderately steep, forested mountain slopes can generally be divided into three types: noncalcareous, calcareous, and ash influenced. Noncalcareous soils include the Sharrott, Tevis, and Winkler series. Calcareous soils include the Beeskove, Eaglewing, Felan, and Repp series. The Holloway, Mitten, and Phillcher series contain a surface layer of volcanic ash-influenced loess.

The sills and dikes intruded into the Belt sediments are high in iron and magnesium and relatively low in silica. Their rock type ranges from diorite to gabbro, and their physical appearance varies. Soils formed in these intrusive igneous rocks are the Petty and Selway series; they occur mainly on moderately steep mountain slopes and ridges. Petty soils contain a volcanic ash-influenced surface layer.

Paleozoic "Ancient Life" System (570 to 245 mya). The only other sedimentary rocks that occur in the survey area were deposited during the mid- to upper-Cambrian Period, approximately 550- to 505-million years ago. They occur in a north-northwest trending

band just west of Fishtrap Creek and consist of a basal sandstone overlain by an alternating sequence of shale and limestone. The basal unit, the Flathead Formation, is mapped across most of Montana; however, the upper carbonate unit is not differentiated into separate formations here.

The Flathead Formation consists primarily of quartzite. It is overlain by a thin section of shale that contains trilobite fossils. The shale is overlain by gray to tan limestone and dolomite beds with an exposed thickness of approximately 2,500 feet (760 meters).

Mesozoic "Middle Life" System (245 to 66 mya). Two large Cretaceous-aged (144 to 66 mya) intrusions occur in Sanders County, although they are not in the survey area. In addition, several smaller granitic intrusions are associated with small mining districts.

The Twenty-Odd Stock, associated with the emplacement of the large Idaho Batholith to the west, is located across the Clark Fork River from Trout Creek at the mouth of the Vermilion River and has a granitic composition. This stock is commonly porphyritic with large crystals set in a fine-grained groundmass. The Vermilion River (Silver Butte) Mining District includes both placer and lode mines and is associated with this intrusion.

A large intrusion, associated with the White Pine (Beaver Creek) Mining District, is located in the drainage between Beaver and Little Beaver Creeks. This intrusion is approximately 105-million years old and is composed of rocks that are low in iron and silica, such as syenite.

Cenozoic "Recent Life" System (66 mya to present). Tertiary-aged volcanic rocks are exposed in the Hog Heaven Volcanic Field. Rock types associated with this extrusive deposit consist of silica-rich flows and domes, ash-flow tuffs, and a volcanoclastic unit that consists of water-worked volcanic materials, mudflows, and breccias. The tuff in the Sullivan Hill area has weathered into spires that are visible from the highway. The silver-lead deposit in the Hog Heaven Mining District is associated with this volcanic field. Soils derived from the Tertiary volcanics include the Battlebutte and Bigdraw series.

Minor amounts of Tertiary-aged (66 to 1.6 mya) basin-fill deposits are exposed in the survey area. They are associated with the Hog Heaven Volcanic Field and consist of semiconsolidated to consolidated conglomerate with interbedded shale, coal, and ash. These deposits are exposed to the southwest of the volcanic field along the north and west sides of the Little Bitterroot Valley near Niarada, and they underlie the Lonepine Aquifer throughout much of the valley.

Fine-textured soils formed in Tertiary deposits on foothills include the Bowlake and Minesinger series. Calcareous, coarse-textured soils on foothills include the Hogsby and Niarada series.

A variety of surficial Quaternary (1.6 mya to present) deposits occur within the survey area. They consist primarily of alluvium, terrace deposits, and glacial moraines and outwash. These deposits are generally unconsolidated and relatively thin. Only the major drainages contain significant amounts of Quaternary-aged alluvium.

Soils formed in older alluvial deposits are the Biglake, Camascreek, Gird, Grantsdale, Marklepass, McCollum, Moiese, and Whitearth series. Soils formed in recent alluvium include the Bigbeaver, Bohnly, Bolack, Gardencreek, Horseplains, Lamoose, and Revais series.

A variety of glacial deposits occur within the survey area. Moraines are hummocky, unsorted deposits that cover the valley bottoms and extend up adjacent slopes. A good example of a moraine occurs near the Big Draw. Soils formed on moraines include the Waldbillig, Wildgen, and Winfall series. Soils formed in glacial lakebed deposits include the Belton, Fernline, Half Moon, Irvine, Lionwood, Lonepine, Redlock, Round Butte, Scotmont, and Selow series. The Doglake and Remount soils formed on gravelly ripple marks from glacial outwash. The Beaverdump, Bonnash, and Dewberry series represent well-defined outwash terraces from Glacial Lake Missoula.

Mineral and Ground-Water Resources

Marie Marshall Garsjo, Montana State Geologist, Natural Resources Conservation Service, prepared this section

The survey area lies in a heavily mineralized region, containing 13 named mining districts and hundreds of prospects and mines that have been worked in the past. In general, mineralization occurs near igneous intrusions and in faulted areas. A wide range of mineralization is present, occupying a variety of host rocks. Most of the mineral production has been copper, lead, silver, and zinc.

The survey area contains seven recognized types of potential ore deposits. They are:

1. Placer gold.
2. Stratabound copper-silver deposits that are confined to a single stratigraphic unit or bedding plane.
3. Stratabound lead-zinc-silver that contains accessory arsenic, sulfur, antimony, and tin.
4. Porphyry molybdenum-tungsten with accessory bismuth that occurs as low-grade deposits in

which sulfide minerals are distributed as stockworks and disseminated grains and are mined in bulk.

- 5. Platinum-group metals, primarily platinum and palladium with accessory copper and nickel.
- 6. Epithermal silver with accessory copper, lead, and gold that formed at shallow depths and low temperatures.
- 7. Mesothermal base- and precious-metal veins that were formed at moderate temperatures and pressures.

Minor amounts of uranium minerals, barite, cobalt, and fluorite occur in the survey area. Antimony was mined and smelted in the Prospect Creek District southwest of Thompson Falls. Currently, there are antimony prospects in this area, but none are being mined. The ore that is smelted and refined is imported primarily from China.

Exploration work has been completed on the Rock Creek Deposit in the Cabinet Mountain Wilderness and the Montanore Deposit located a few miles to the east. These deposits have large silver and copper reserves and are currently in the permitting process.

Placer gold has been mined from the Clark Fork River, near the mouth of Trout Creek; Trout Creek; Vermilion River; and a small area in the Prospect Creek drainage. Placer gold has been found in Tertiary, Pleistocene, and recent alluvium, although the most abundant deposits have been found along present watercourses. The gold occurs in small pockets, both as flakes and large nuggets, and throughout sand and gravel, as erratically distributed particles.

There are no oil or gas fields in the survey area. Until recently, the geology has been considered unfavorable for the occurrence of petroleum resources; however, there has been some interest in what may be trapped beneath the large thrust sheets of Precambrian rock. Seismic exploration has been conducted in the younger carbonates and sandstones that underlie the Belt sediments. Some wildcat drilling was completed in the 1980s. These rocks act as significant petroleum reservoirs in other areas of Montana. However, the great depth of overlying Precambrian sediments and high drilling costs make the chances of large oil or gas production seem unfavorable.

Nonmetallic resources are also mined in the survey area. Gravel is produced from glacial moraines and valley plugs. Argillite and quartzite flagstones are mined for use as decorative rock.

In 1992, active exploration projects recorded by the Montana Bureau of Mines and Geology included the Chau Mine for copper, zinc, and lead in the

Cherry Creek drainage; the David King Gold Mine in the Vermilion River drainage; the Glidden Mine for copper, lead, and zinc on Glidden Creek; the Miners Gulch Prospect for copper and silver on the Vermilion River; the Riverside Lead-Zinc Mine on Prospect Creek; the Rock Creek Copper-Silver Deposit mentioned above; the Sheep Creek Lead-Zinc Prospect just upstream of the confluence of the Clark Fork River with the Flathead River; and the Trout Creek Copper-Silver Prospect.

Because of the geologic nature of this region, limited areas are suitable for significant ground-water development. The older, consolidated bedrock formations yield only small amounts of water, most of which is developed from fractures or bedding planes as the bedrock itself is generally of low permeability. Because of the significant amount of regional folding and faulting, most of the bedrock is fractured to some degree. Water quality is good in the bedrock aquifers.

Unconsolidated alluvium and glacial deposits are the most widely used aquifers in the survey area. Yield is highly variable, although most wells have yields between 10 and 20 gallons per minute or gpm (38 and 76 liters per minute or lpm). Yield is dependent on the amount of sand and gravel lenses penetrated and their degree of interconnection. Of the 172 wells listed in the state well database with yields of over 99 gpm (374 lpm), only three are not located in these unconsolidated deposits. Water quality is good to excellent.

The Lonepine Aquifer is a highly productive confined aquifer located in glacial outwash in the Little Bitterroot Valley. The aquifer consists of a bed of clean gravel that is between 20- and 60-feet (6- and 18-meters) thick. It is confined by 200 to 350 feet (60 to 110 meters) of silty clay lakebed sediments, which create artesian pressures in the aquifer. Wells below an elevation of 2,780 feet (847 meters) flow up to 800 gpm (2,300 lpm), but they are subject to declines in pressure and yield because of well interference.

Well use, current to March 1994, for the survey area is summarized below. This information was provided by the Montana Ground-Water Information Center's water well database. Often wells have multiple uses and are listed under both domestic and stockwater supplies, so the total appears to be less than the sum of the uses. Wells reporting yields greater than 99 gpm totaled 172. Of these wells, eight reported yields greater than 999 gpm (3,776 lpm); the highest reported yield was 1,500 gpm (5,670 lpm).

TOTAL WELLS	1,915
Domestic	1,427

Stockwater	291
Irrigation	171
Monitoring	54
Unused	44
Commercial	22
Public Supply	19
Industrial	18
Other	10
Institutional	5
Fire Protection	3
Abandoned	2
Research	2

Geothermal Resources and Seismic Activity

Marie Marshall Garsjo, Montana State Geologist, Natural Resources Conservation Service, prepared this section.

The survey area contains two geothermal areas, Camas and Camp Aqua; both are located in the Little Bitterroot Valley. The hot water is derived from deep circulation systems within fractured Belt bedrock. It is likely that each geothermal area has a single large warm water reservoir underlying it at considerable depth. These thermal systems may share a deep thermal reservoir; however, they are not hydraulically connected in the near-surface environment.

The Camas geothermal area is located along the contact between Belt bedrock and the lakebed sediments north of the town of Hot Springs. Hot water seeps upward along an east-northeast trending fault system through the thin alluvial overburden and is discharged as springs. The hot springs have a total flow of 100 to 150 gpm (400 to 600 lpm). The temperatures range from 47 to 51 degrees C. Additional wells have been drilled near the hottest springs in order to find a source of hotter water; however, no higher temperatures were found.

The Camp Aqua geothermal area is 7 miles southeast of Camas and consists of approximately 600 acres. Flowing artesian wells from the Lonepine Aquifer have elevated temperatures, ranging between 25 and 52 degrees C. Here, hot water is discharged into the Lonepine Aquifer and diluted in an elongate zone between the towns of Lonepine and Oliver Gulch. This area was once developed for a geothermally powered ethanol production plant.

The geothermal water contains moderate arsenic concentrations that are above the U.S. Environmental Protection Agency's upper limit for potability. The water also contains detectable hydrogen sulfide concentrations as well as boron, chloride, and lithium. Dissolved silica and the elevated hydrogen sulfide

concentrations make this water aesthetically undesirable for drinking.

The survey area is located within the intermountain seismic belt, although its seismic activity is relatively quiet for this region. The intermountain seismic belt extends from southern Nevada north to Flathead Lake and is characterized by shallow seismicity, earthquake swarms, and normal fault scarps with evidence of Quaternary or historic movement.

Seismicity information was provided by the Earthquake Studies Office of the Montana Bureau of Mines and Geology for an area bounded on the north and south by latitudes 47.1 and 48.3 degrees N and on the east and west by longitudes 114.5 and 116 degrees W. This is approximately the area between Frenchtown at the southeastern corner and Noxon near the northwestern corner and includes the mines near Wallace, Idaho. The data show 121 recorded earthquakes in this area between 1982 and 1993, with Richter magnitudes between 1.5 and 4.2.

Microearthquakes are earthquakes with magnitudes of 2.0 or less. They are not commonly felt and are recorded only on local seismographs. It is unusual for earthquakes with magnitudes under 4.5 to cause any significant damage. While the historical record is short, little evidence indicates that the faults in the Lewis and Clark Line are active today. The survey area is not considered to have a high seismic hazard.

Climate

The survey area is usually warm in the summer with temperatures around 65 degrees F. Winters are cool with temperatures around 25 degrees F. The area as a whole has a modified continental climate, but mountain effects on temperature and precipitation vary widely. The climate is usually mild along the river bottoms throughout the year. The survey area lies within the only major area in the state where the January temperatures average over 24 degrees F. The average July temperature is between 60 and 68 degrees F. The amount of precipitation is generally high compared to the rest of the state because of a warm, moist maritime climatic influence. During the winter, the coldest weather is from Arctic air invasions. These invasions are usually followed by warmer air masses from the west or southwest. Chinook winds often raise temperatures dramatically in a short period.

Along the Bitterroot Range, the mean annual precipitation is over 35 inches, with more than

60 inches on the mountain peaks. Near the Montana-Idaho border, the mountains often receive over 100 inches of precipitation. Along the forested eastern part of the survey area and in the Cabinet Mountains, the average precipitation is 25 to 35 inches with more than 60 inches on the mountain peaks. In the semiarid valleys on the eastern edge of the survey area, the average precipitation is less than 14 inches.

Most precipitation falls from November through February. May and June have the highest growing-season precipitation. The Clark Fork River's high runoff of 2 million acre-feet of water per month occurs during the same May to June period.

In winter, the average temperature is 27 degrees F at Heron and Hot Springs, 28 degrees F at Trout Creek, and 29 degrees F at Thompson Falls. The average daily minimum temperature is 19 degrees F at Hot Springs, 20 degrees F at Heron and Trout Creek, and 22 degrees F at Thompson Falls. The lowest recorded temperature was -40 degrees F at Trout Creek. In summer, the average temperature is 62 degrees F at Heron, 65 degrees F at Hot Springs, 66 degrees F at Thompson Falls, and 63 degrees F at Trout Creek. The average daily maximum temperature is 80 degrees F at Heron, 82 degrees F at Hot Springs, 85 degrees F at Thompson Falls, and 83 degrees F at Trout Creek. The highest recorded temperature was 110 degrees F at Trout Creek.

Growing-degree days, shown in the table "Temperature and Precipitation," are equivalent to heat units. During the month, growing-degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal growing-degree accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total mean annual precipitation is 33 inches at Heron, 14 inches at Hot Springs, 23 inches at Thompson Falls, and 29 inches at Trout Creek.

Winds are predominantly from the southwest, with a high seasonal average of 15 miles per hour during winter and 7 miles per hour during summer.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. This information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil

scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the survey area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, soil scientists develop a concept, or model, of how the soils were formed. During mapping, this model enables soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates; kind and amount of rock fragments; distribution of plant roots; reaction; and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other

areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret data from these analyses and tests as well as field-observed characteristics and soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data for crop yields under high levels of management are modeled and validated with farm records and field or plot information on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as

climate and biological activity. Soil conditions are predictable over long periods, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Descriptions, names, and delineations of the soils in this survey area may not fully agree with those of the soils in adjacent survey areas. Differences result from a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

Temperature and Precipitation

(Recorded in the period 1961-1995 at Heron NW, Thompson Falls, and Trout Creek Ranger Station)

	Temperature (Degrees F)					Precipitation (Inches)					
Month	Average Daily Maximum	Average Daily Minimum	Average	2 Years in 10 Will Have—		Average Number of Growing- degree Days*	Average	2 years in 10 Will Have—		Average Number of Days With 0.10 or More	Average Total Snowfall
				Maximum Temperature More Than	Minimum Temperature Less Than			Less Than	More Than		
HERON NW:											
January---	31.5	19.2	25.4	46	-15	0	4.46	2.53	6.18	10	28.1
February---	37.9	22.4	30.1	52	-8	1	3.34	1.82	4.68	8	15.2
March----	45.8	25.9	35.9	65	3	21	2.63	1.48	3.65	8	7.4
April----	56.8	31.8	44.3	79	19	149	2.13	1.23	2.92	6	1.4
May-----	66.7	37.8	52.2	88	24	379	2.51	1.65	3.28	7	0.2
June-----	73.6	43.9	58.8	93	31	563	2.80	1.53	3.92	7	0.0
July-----	81.0	46.1	63.6	97	34	731	1.27	0.43	2.02	3	0.0
August----	80.2	45.3	62.8	97	32	710	1.60	0.45	2.61	4	0.0
September---	69.3	39.5	54.4	88	24	431	1.89	0.86	2.88	4	0.0
October---	55.2	32.8	44.0	74	17	152	2.28	0.86	3.48	6	0.4
November---	39.7	28.0	33.8	57	4	15	4.39	2.58	5.99	10	9.7
December---	32.1	21.5	26.8	48	-13	1	4.45	2.94	5.82	11	24.6
Yearly:											
Average---	55.8	32.8	44.3	—	—	—	—	—	—	—	—
Extreme---	106.0	-35.0	—	98	-21	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,154	33.74	29.37	37.96	84	87.1
THOMPSON FALLS:											
January---	34.5	20.5	27.5	52	-10	2	2.73	1.33	3.94	7	13.0
February---	42.8	24.1	33.4	60	-5	9	1.98	0.91	2.90	5	4.8
March----	51.9	27.6	39.8	72	8	71	1.86	1.19	2.46	6	3.3
April----	62.0	33.2	47.6	85	21	234	1.56	0.81	2.21	5	0.0
May-----	71.2	39.7	55.4	93	27	477	2.05	1.21	2.81	6	0.0
June-----	78.4	46.2	62.3	97	35	671	2.18	1.15	3.08	5	0.0
July-----	86.8	49.4	68.1	102	38	868	1.12	0.55	1.73	3	0.0
August----	86.8	48.9	67.8	103	37	865	1.32	0.50	2.15	3	0.0
September---	75.7	41.6	58.6	95	26	558	1.30	0.60	1.98	4	0.0
October---	60.7	34.2	47.5	82	19	243	1.75	0.70	2.63	5	0.0
November---	43.0	28.5	35.7	61	7	27	2.57	1.49	3.54	7	3.9
December---	34.7	22.5	28.6	50	-9	2	2.72	1.53	3.77	8	13.9
Yearly:											
Average---	60.7	34.7	47.7	—	—	—	—	—	—	—	—
Extreme---	107.0	-30.0	—	104	-17	—	—	—	—	—	—
Total-----	—	—	—	—	—	4,027	23.14	19.80	26.35	64	39.0

See footnote at end of table.

Temperature and Precipitation--Continued

	Temperature (Degrees F)					Precipitation (Inches)					
Month	Average	Average	Average	2 Years in 10		Average	Average	2 years in 10		Average	Average
	Daily	Daily		Will Have—		Number		Will Have—		Number	
	Maximum	Minimum		Maximum	Minimum	of		Less	More	of Days	
				Temperature	Temperature	Growing-		Than	Than	With	
				More Than	Less Than	degree				0.10 or	Total
						Days*				More	Snowfall
TROUT CREEK:											
January---	33.7	18.8	26.2	50	-18	1	3.92	1.89	5.68	9	21.5
February---	41.3	22.2	31.8	58	-11	4	2.80	1.40	4.01	8	9.7
March----	49.7	26.0	37.8	69	3	44	2.32	1.08	3.40	7	4.7
April----	59.8	31.0	45.4	83	17	177	1.84	1.07	2.52	5	0.3
May-----	69.3	36.6	52.9	91	22	399	2.20	1.31	2.99	6	0.0
June-----	76.3	42.7	59.5	95	30	582	2.38	1.28	3.35	6	0.0
July-----	84.7	45.1	64.9	100	32	768	1.26	0.58	1.98	3	0.0
August----	85.6	44.7	65.2	102	31	781	1.34	0.56	2.15	3	0.0
September---	74.8	38.6	56.7	94	23	491	1.48	0.66	2.26	4	0.0
October---	59.7	32.1	45.9	82	16	199	1.95	0.76	3.05	5	0.0
November---	42.2	27.7	35.0	61	4	20	3.79	2.17	5.24	10	6.5
December---	33.8	21.0	27.4	48	-15	1	3.86	2.32	5.24	10	19.6
Yearly:											
Average---	59.2	32.2	45.7	—	—	—	—	—	—	—	—
Extreme---	110.0	-40.0	—	103	-25	—	—	—	—	—	—
Total-----	—	—	—	—	—	3,466	29.14	24.84	32.69	76	62.3

* A growing-degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold: 40.0 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-1995 at Heron NW, Thompson Falls, and Trout Creek Ranger Station)

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
HERON NW:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 10	May 24	June 27
2 years in 10 later than----	May 2	May 19	June 19
5 years in 10 later than----	April 17	May 9	June 2
First freezing temperature in fall: August-December			
1 year in 10 earlier than---	September 17	September 7	August 25
2 years in 10 earlier than--	September 26	September 14	August 31
5 years in 10 earlier than--	October 12	September 26	September 12
THOMPSON FALLS:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	April 24	May 14	May 28
2 years in 10 later than----	April 18	May 9	May 23
5 years in 10 later than----	April 8	April 30	May 14
First freezing temperature in fall: August-December			
1 year in 10 earlier than---	October 1	September 16	September 5
2 years in 10 earlier than--	October 9	September 23	September 10
5 years in 10 earlier than--	October 26	October 6	September 20
TROUT CREEK:			
Last freezing temperature in spring: January-July			
1 year in 10 later than-----	May 19	June 6	July 6
2 years in 10 later than----	May 11	May 30	June 27
5 years in 10 later than----	April 26	May 17	June 11
First freezing temperature in fall: August-December			
1 year in 10 earlier than---	September 16	August 31	August 20
2 years in 10 earlier than--	September 24	September 7	August 26
5 years in 10 earlier than--	October 11	September 21	September 7

Growing Season

(Recorded in the period 1961-1995 at Heron NW, Thompson Falls, and Trout Creek Ranger Station)

Probability	Daily Minimum Temperature		
	Higher Than 24 Degrees F	Higher Than 28 Degrees F	Higher Than 32 Degrees F
	<i>Days</i>	<i>Days</i>	<i>Days</i>
HERON NW:			
9 years in 10-----	141	114	69
8 years in 10-----	153	123	79
5 years in 10-----	177	139	100
2 years in 10-----	200	156	121
1 year in 10-----	212	164	132
THOMPSON FALLS:			
9 years in 10-----	171	132	105
8 years in 10-----	181	141	113
5 years in 10-----	200	158	129
2 years in 10-----	219	175	145
1 year in 10-----	229	184	153
TROUT CREEK:			
9 years in 10-----	130	98	56
8 years in 10-----	143	108	67
5 years in 10-----	168	128	88
2 years in 10-----	193	148	110
1 year in 10-----	207	158	121

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The tables, "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," at the end of this section show the classification and extent of the soils in this survey area.

Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface. Soil has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the effect of climate on the parent material, the kinds of plants and organisms living in the soil, the relief of the land, the physical and chemical composition of the parent material, and the length of time it took for the soil to form.

Within short distances, the combination of these factors varies, and, consequently, the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs, the factors of soil formation are discussed as they relate to the soils in the survey area.

Climate

Temperature and precipitation mainly determine climate, an active force in the formation of soils. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Chemical reactions, such as solution and hydration, further break down this weathered material.

Precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored. Soils that have warm

temperatures and low precipitation generally contain less organic matter and are light colored.

In the survey area, the mean annual precipitation is about 12 inches in the Hot Springs Valley, 16 inches in the Plains Valley, and increases to about 34 inches in the Heron area at the Idaho state line. Throughout the survey area, the mean annual temperature in the valleys ranges from 42 degrees F to 46 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and microorganisms affect gains or losses in organic matter, plant nutrients in the soil, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Microorganisms, chemicals in the soil, and insects change leaves, roots, and entire plants that remain in the surface layer to humus. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the survey area are ground squirrel, mice, and rabbit.

Vegetation in this survey area consists mainly of bunch grasses, mid grasses, and shrubs on the rangeland. Douglas-fir and ponderosa pine are the common low-elevation tree species at the dry end of the survey area, with western larch, lodgepole pine, grand fir, Engelmann spruce, western redcedar, western white pine, and western hemlock increasing in that order with increasing precipitation toward the Idaho state line. Subalpine fir is a common high-elevation stand component.

Topography

Topography, or relief, is determined by glaciation and mountain formation and by the age and resistance of geologic formations to erosion by wind and water. Topography influences soil development through its effect on drainage and runoff. The

topography of the survey area closely affects the local climate. The amount of precipitation and the degree of air temperature can have wide variations within short distances.

Topography in this survey area can be distinctively separated into mountains and valleys. The mountains rise 2,000 to 4,000 feet above the valleys and are moderately steep to very steep with numerous side drainages. The valley floor lying below the mountains is nearly level to gently sloping with steep terrace escarpments along the Clark Fork River.

In the mountains, generally, steepness and shape of slope affect depth to bedrock, amount of rock fragments, and number and distinctness of soil horizons. Soils on steep convex slopes generally have a greater amount of rock fragments, are shallower to bedrock, and have fewer and less distinct soil horizons. Examples of this general principal are the Winkler soil on very steep slopes and the Yourame soil on moderate slopes.

In the valleys, the number and distinctness of soil horizons generally decreases as slope increases. Examples of this general principal are the Irvine soil on steep and very steep slopes and the Round Butte soil on nearly level to strongly slopes.

Parent Material

Soils have formed in a number of parent materials in the survey area. Most of the soils in the valleys are formed in mixed alluvium, lake sediments, or glacial till. The mountains and bedrock-controlled hills may have soils formed in one of the following parent materials: argillite, igneous volcanics, limestone, or quartzite.

A single parent material under the influence of varying amounts of precipitation exhibits marked changes in soil development. Examples of this principal are soils, such as the Bemishave, Fernline, and Whitepine series, that formed in lake sediments and are generally silty to clayey. Other examples are soils, such as the Combest, Mitten, and Stevie series, that formed in argillite and quartzite and are generally loamy with a high rock fragment content and a volcanic ash cap. Soils, such as the Tevis and Winkler series, formed in argillite and quartzite but without the ash cap. Soils, such as the Ashworth, Bata, Courvash, Courville, Wildgen, and Winfall series, formed in glacial till and are generally loamy with few coarse fragments.

Many of the soils in the survey area have accumulated lime from the parent materials. The presence, depth, or amount of lime varies with parent materials and precipitation in the specific area.

Time

Change taking place in soils over a long period is called soil genesis. As a result of these changes, distinct horizons, or layers, develop in the soils. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kind and arrangement of these horizons are called soil morphology. These layers are described in terms of chemistry, color, consistence, permeability, structure, texture, and thickness.

Soils are classified according to their approximate age, from young to mature. Age, or maturity, of a soil is generally indicated by the thickness and distinctness of subsurface horizons, content of organic matter and clay, depth to which soluble material is leached, and form and distribution of calcium carbonate and gypsum in the soil.

The young Horseplains soil is an Entisol that formed in alluvium on flood plains. These soils contain little organic matter from which to form an A horizon and have no clay accumulation. Little translocation of carbonates has occurred.

The mature McDonald soil is a Mollisol that formed in parent material that is similar to that of the Horseplains soil but is much older. McDonald soil formed in alluvium on alluvial fans, hills, and stream terraces. This soil contains enough organic matter to have a dark A horizon and also have a distinct clay accumulation in the subsoil. Nearly all of the carbonates have been leached below a depth of about 24 inches.

Many of the sloping and steep, shallow, and very shallow soils appear to have been in the process of formation for about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case, the effect of time has been offset by the effect of relief.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table, "Classification of the Soils," shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol, from *mollis*, meaning soft.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeroll (*Xer*, meaning dry, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxeroll (*Hapl*, meaning minimal horizonation, plus *xeroll*, the suborder of the Mollisols that has a xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have

some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Calcic Haploxerolls (*Calcic*, implying the presence of a calcic horizon).

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-silty over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Haploxerolls.

SERIES. The series consists of soils within a family that have horizons similar in arrangement in the profile, color, consistence, mineral and chemical composition, reaction, structure, and texture. An example is the Grantsdale series. The soils in the Grantsdale series are coarse-silty over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Haploxerolls.

Soil Series and Detailed Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class, there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are

called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and, consequently, they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all of the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all of the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is

divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Bigarm gravelly loam, alluvial, 2 to 8 percent slopes, is a phase of the Bigarm series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

This survey includes *complexes*. They consist of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Gird-McCollum complex, 4 to 8 percent slopes, is an example.

This survey includes *miscellaneous areas*. They have little or no soil material and support little or no vegetation. Riverwash is an example.

The "Acreage and Proportionate Extent of the Soils" table in Parts I and II of the manuscript gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. Many of the terms used in describing the soils or miscellaneous areas are defined in the "Glossary."

Ashworth Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines and mountains

Parent material: Volcanic ash over calcareous loamy glacial till

Slope range: 2 to 50 percent

Elevation range: 3,400 to 4,200 feet

Annual precipitation: 28 to 36 inches

Annual air temperature: 38 to 44 degrees F

Frost-free period: 40 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Eutrocrepts

Typical Pedon

Ashworth gravelly silt loam, 8 to 30 percent slopes, in an area of forestland, 2,900 feet north and 700 feet east of the southwest corner of sec. 6, T. 26 N., R. 26 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 1 inches; dark brown (10YR 4/3) gravelly silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; volcanic ash component; 15 percent pebbles; moderately acid; abrupt wavy boundary.

Bw—1 to 10 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

2E—10 to 20 inches; dark grayish brown (2.5Y 4/2) gravelly loam, light brownish gray (2.5Y 6/2) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium and few coarse roots; 25 percent pebbles; moderately acid; clear wavy boundary.

2Bk1—20 to 36 inches; grayish brown (2.5Y 5/2) very gravelly loam, light gray (2.5Y 7/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium and few coarse roots; 10 percent cobbles and 30 percent pebbles; disseminated lime; few distinct lime coatings on the undersides of fragments; strongly effervescent; neutral; gradual wavy boundary.

2Bk2—36 to 50 inches; grayish brown (10YR 5/2) very gravelly loam, light gray (10YR 7/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium and few coarse roots; 15 percent cobbles and 35 percent pebbles; disseminated lime; many distinct lime coatings on undersides of fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

2C—50 to 60 inches; grayish brown (10YR 5/2) very cobbly sandy loam, light gray (10YR 7/2) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; 20 percent cobbles and 35 percent pebbles; disseminated lime; many distinct lime coatings on undersides of fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 44 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 15 to 22 inches

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 20 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent
 Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist
 Clay content: 5 to 15 percent
 Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent
 Reaction: pH 5.6 to 6.5

2E horizon

Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Clay content: 10 to 20 percent
 Content of rock fragments: 20 to 30 percent—0 to 5 percent cobbles; 20 to 25 percent pebbles
 Reaction: pH 5.6 to 6.5

2Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2 or 3
 Clay content: 10 to 20 percent
 Content of rock fragments: 35 to 50 percent—10 to 15 percent cobbles; 25 to 35 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.4 to 8.4

2Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2 or 3
 Texture: Loam or sandy loam
 Clay content: 10 to 20 percent
 Content of rock fragments: 35 to 60 percent—10 to 20 percent cobbles; 25 to 40 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.4 to 8.4

2C horizon

Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2 or 3
 Clay content: 10 to 20 percent
 Content of rock fragments: 50 to 60 percent—15 to 20 percent cobbles; 35 to 40 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.4 to 8.4

48C—Ashworth gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Moraines
Slope: 2 to 8 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 28 to 36 inches
Frost-free period: 40 to 70 days

Composition

Major Components

Ashworth and similar soils: 90 percent

Minor Components

Mollman gravelly loam: 0 to 4 percent
 Slopes greater than 8 percent: 0 to 3 percent
 Auggie silt loam: 0 to 2 percent
 McLangor mucky peat: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

48E—Ashworth gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Moraines
Slope: 8 to 30 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 28 to 36 inches
Frost-free period: 40 to 70 days

Composition

Major Components

Ashworth and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent
 Mollman gravelly loam: 0 to 3 percent
 Auggie silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

48F—Ashworth gravelly silt loam, 30 to 50 percent slopes**Setting**

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 28 to 36 inches
Frost-free period: 40 to 70 days

Composition**Major Components**

Ashworth and similar soils: 90 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Felan gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Auggie Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Lake plains and terraces
Parent material: Lacustrine deposits
Slope range: 2 to 30 percent
Elevation range: 3,400 to 4,400 feet
Annual precipitation: 26 to 30 inches
Annual air temperature: 37 to 42 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-silty, mixed, active Eutric Glossocryalfs

Typical Pedon

Auggie silt loam, 2 to 8 percent slopes, in an area of forestland, 2,000 feet north and 2,600 feet east of the southwest corner of sec. 32, T. 26 N., R. 26 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 10 inches; white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; moderately acid; clear smooth boundary.

Bt/E1—10 to 16 inches; B part (60 percent) is very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; E part (40 percent) is white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; moderate coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; few faint clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt/E2—16 to 30 inches; B part (80 percent) is pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; E part (20 percent) is white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; moderate coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; common distinct clay films on faces of peds and in pores; slightly acid; gradual smooth boundary.

Bt—30 to 48 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse

subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; common distinct clay films on faces of peds and in pores; slightly acid; clear smooth boundary.

- C1—48 to 52 inches; very pale brown (10YR 7/3) very fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; neutral; clear smooth boundary.
- C2—52 to 60 inches; white (10YR 8/2) and very pale brown (10YR 7/3) varved silt loams, light brownish gray (10YR 6/2) and brown (10YR 5/3) moist; moderate medium platy lacustrine sediments; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; disseminated lime; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between 4 and 12 inches

Depth to lime: 48 to 60 inches

E horizon

Hue: 10YR or 7.5YR

Value: 7 or 8 dry; 5 or 6 moist

Clay content: 10 to 20 percent

Reaction: pH 5.6 to 6.0

Bt/E horizons

Hue: 10YR or 7.5YR

Value: B part: 6 or 7 dry, 4 or 5 moist; E part: 7 or 8 dry, 5 or 6 moist

Chroma: B part: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 15 to 35 percent

Reaction: pH 6.1 to 6.5

Bt horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 6.5

C1 horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Very fine sandy loam or silt loam

Clay content: 10 to 20 percent

Reaction: pH 6.1 to 7.3

C2 horizon

Hue: 10YR or 7.5YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 7.8

12C—Auggie silt loam, 2 to 8 percent slopes

Setting

Landform: Lake plains and terraces

Slope: 2 to 8 percent

Elevation: 3,400 to 4,400 feet

Mean annual precipitation: 26 to 30 inches

Frost-free period: 50 to 70 days

Composition

Major Components

Auggie and similar soils: 90 percent

Minor Components

Half moon silt loam: 0 to 5 percent

Ashworth gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 11.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

12E—Auggie silt loam, 8 to 30 percent slopes

Setting

Landform: Lake plains and terraces

Position on landform: Dissected or incised treads

Slope: 8 to 30 percent

Elevation: 3,400 to 4,400 feet

Mean annual precipitation: 26 to 30 inches

Frost-free period: 50 to 70 days

Composition

Major Components

Auggie and similar soils: 90 percent

Minor Components

Upsata gravelly silt loam: 0 to 5 percent

Crystalex loamy coarse sand: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 11.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Backroad Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Volcanic ash over glacial outwash

Slope range: 0 to 15 percent

Elevation range: 3,400 to 3,900 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 46 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Dystrudepts

Typical Pedon

Backroad gravelly silt loam, 4 to 15 percent slopes, in an area of forestland, 1,800 feet south and 2,100 feet west of the northeast corner of sec. 14, T. 21 N., R. 26 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly silt loam, grayish brown (10YR 5/2) dry; weak, fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine,

medium, and coarse roots; 20 percent pebbles; slightly acid; clear wavy boundary.

Bw—3 to 12 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; 25 percent pebbles; slightly acid; clear wavy boundary.

2E—12 to 21 inches; brown (10YR 5/3) very gravelly silt loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 40 percent pebbles; slightly acid; clear wavy boundary.

2E/Bw1—21 to 32 inches; E part (80 percent) is pale brown (10YR 6/3) extremely gravelly silt loam, very pale brown (10YR 8/3) dry; B part (20 percent) is yellowish brown (10YR 5/4) extremely gravelly silt loam, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 60 percent pebbles; slightly acid; gradual wavy boundary.

2E/Bw2—32 to 60 inches; E part (60 percent) is pale brown (10YR 6/3) extremely gravelly silt loam, very pale brown (10YR 8/3) dry; B part (40 percent) is yellowish brown (10YR 5/4) extremely gravelly silt loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable, nonsticky, nonplastic; few fine, medium, and coarse roots; 15 percent cobbles and 70 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 44 to 48 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 30 percent—0 to 5 percent cobbles; 15 to 25 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + ¹/₂Fe: 1.0 to 1.5 percent

Reaction: pH 5.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 30 percent—0 to 5 percent cobbles; 15 to 25 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent
 Reaction: pH 5.6 to 7.3

2E horizon

Value: 6 or 7 dry; 5 or 6 moist
 Clay content: 8 to 15 percent
 Content of rock fragments: 35 to 55 percent—5 to 15 percent cobbles; 30 to 40 percent pebbles
 Reaction: pH 5.6 to 7.3

2E/Bw1 horizon

Value: E part: 6, 7, or 8 dry, 5, 6, or 7 moist;
 B part: 5, 6, or 7 dry, 4, 5, or 6 moist
 Clay content: 8 to 15 percent
 Content of rock fragments: 60 to 80 percent—5 to 20 percent cobbles; 55 to 60 percent pebbles
 Reaction: pH 5.6 to 7.3

2E/Bw2 horizon

Value: E part: 6, 7, or 8 dry, 5, 6, or 7 moist;
 B part: 5, 6, or 7 dry, 4, 5, or 6 moist
 Clay content: 5 to 15 percent
 Content of rock fragments: 65 to 85 percent—10 to 15 percent cobbles; 55 to 70 percent pebbles
 Reaction: pH 5.6 to 7.3

83B—Backroad gravelly silt loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 3,400 to 3,900 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Backroad and similar soils: 85 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent
 Bignell gravelly loam: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

83D—Backroad gravelly silt loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces
Position on landform: Dissected or incised treads
Slope: 4 to 15 percent
Elevation: 3,400 to 3,900 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Backroad and similar soils: 85 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
 Bignell gravelly loam: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over alluvium or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Barzee Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderate

Landform: Moraines and closed depressions

Parent material: Organic deposits

Slope range: 0 to 2 percent

Elevation range: 3,200 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Euic, frigid Typic Haplohemists

Typical Pedon

Barzee mucky peat, 0 to 2 percent slopes, on a west-facing moraine, under shrubs and sedges, 2,600 feet north and 1,100 feet west of the southeast corner of sec. 7, T. 26 N., R. 26 W.

Oi—0 to 4 inches; very dark brown (10YR 2/2) broken face and rubbed mucky peat (fibric material); 90 percent fiber and raw herbaceous plant material—70 percent rubbed; massive; nonsticky, nonplastic; 80 percent lycopodium mosses and 20 percent herbaceous species; many very fine and fine roots; moderately acid; clear smooth boundary.

Oe1—4 to 25 inches; black (10YR 2/1) broken face and rubbed mucky peat (hemic material); 60 percent fiber—25 percent rubbed; massive; nonsticky, nonplastic; 90 percent lycopodium mosses and 10 percent herbaceous species; many very fine and fine roots; moderately acid; clear wavy boundary.

Oe2—25 to 55 inches; black (10YR 2/1) and very dark brown (10YR 2/2) broken face and rubbed mucky peat—stratified hemic (80 percent) and fibric (20 percent) material; 40 percent fiber—20 percent rubbed; massive; nonsticky, nonplastic; 80 percent lycopodium mosses and 20 percent herbaceous species; many very fine roots; moderately acid; gradual wavy boundary.

Oe3—55 to 70 inches; black (10YR 2/1) broken face and rubbed mucky peat (hemic material); 40 percent fiber—20 percent rubbed; massive; nonsticky, nonplastic; 90 percent herbaceous species and 10 percent lycopodium mosses; many very fine roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Thickness of organic material: Greater than 52 inches

Depth to the seasonal high water table: Surface to 12 inches

Notes: The Oi horizon is absent in some pedons, and some pedons have an Oe4 horizon.

Oi horizon

Chroma: 1 or 2

Fiber content, unrubbed: 70 to 90 percent

Fiber content, rubbed: 65 to 75 percent

Reaction: pH 5.6 to 6.5

Oe1, Oe2, and Oe3 horizons

Value: 2 or 3

Chroma: 1 or 2

Fiber content, unrubbed: 40 to 60 percent

Fiber content, rubbed: 20 to 30 percent

Reaction: pH 5.6 to 6.5

808A—Barzee mucky peat, 0 to 2 percent slopes

Setting

Landform: Moraines

Slope: 0 to 2 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Barzee and similar soils: 90 percent

Minor Components

Murrstead mucky peat: 0 to 5 percent

McLangor mucky peat: 0 to 5 percent

Major Component Description

Surface layer texture: Mucky-peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Organic deposits

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 21.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bata Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderately slow*Landform:* Moraines*Parent material:* Volcanic ash over glacial till*Slope range:* 2 to 30 percent*Elevation range:* 3,800 to 4,200 feet*Annual precipitation:* 30 to 36 inches*Annual air temperature:* 38 to 42 degrees F*Frost-free period:* 40 to 70 days**Taxonomic Class:** Loamy-skeletal, mixed, superactive Andic Glossocryalfs**Typical Pedon**

Bata gravelly silt loam, 2 to 8 percent slopes, in an area of forestland, 1,400 feet north and 2,200 feet east of the southwest corner, sec. 29, T. 25 N., R. 27 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

E—0 to 1 inches; pale brown (10YR 6/3) gravelly silt loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many fine and medium roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

Bw—1 to 9 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many fine and medium roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

2E/Bt—9 to 23 inches; E part (70 percent) is pinkish gray (7.5YR 7/2) gravelly loam, brown (7.5YR 5/2) moist; B part (30 percent) is pink (7.5YR 7/4) gravelly loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; common distinct clay films on faces of peds; 25 percent pebbles; moderately acid; gradual wavy boundary.

2Bt/E—23 to 40 inches; B part (60 percent) is pink (7.5YR 7/4) gravelly clay loam, brown (7.5YR 5/4) moist; E part (40 percent) is pinkish gray (7.5YR 7/2) gravelly loam, brown (7.5YR 5/2) moist; texture mixed is gravelly clay loam; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few medium and coarse roots; common distinct clay films on faces of peds; 10 percent cobbles and 25 percent

pebbles; moderately acid; gradual wavy boundary.

2Bt—40 to 60 inches; pink (7.5YR 7/4) very gravelly clay loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few medium and coarse roots; common distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; moderately acid.

Range in Characteristics*Soil temperature:* 39 to 44 degrees F*Moisture control section:* Between 4 and 12 inches**E horizon**

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent

Reaction: pH 5.1 to 6.5

Bw horizon

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Texture: Silt loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent

Reaction: pH 5.1 to 6.5

2E/Bt horizon

Hue: 10YR, 7.5YR, or 5YR

Value: E part: 6, 7, or 8 dry, 5 or 6 moist; B part: 5, 6, or 7 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Clay content: 12 to 25 percent

Content of rock fragments: 25 to 35 percent—0 to 10 percent cobbles; 20 to 25 percent pebbles

Reaction: pH 5.6 to 6.5

2Bt/E horizon

Hue: 10YR, 7.5YR, or 5YR

Value: B part: 5, 6, or 7 dry, 4 or 5 moist; E part: 6, 7, or 8 dry, 5 or 6 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 25 to 35 percent—0 to 10 percent cobbles; 20 to 25 percent pebbles
Reaction: pH 5.6 to 6.5

2Bt horizon

Hue: 10YR, 7.5YR, or 5YR
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 3 or 4
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles
Reaction: pH 5.6 to 6.5

**86C—Bata gravelly silt loam,
2 to 8 percent slopes**

Setting

Landform: Moraines
Slope: 2 to 8 percent
Elevation: 3,800 to 4,200 feet
Mean annual precipitation: 30 to 36 inches
Frost-free period: 40 to 70 days

Composition

Major Components

Bata and similar soils: 90 percent

Minor Components

Upsata gravelly silt loam: 0 to 5 percent
Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**86E—Bata gravelly silt loam,
8 to 30 percent slopes**

Setting

Landform: Moraines
Slope: 8 to 30 percent
Elevation: 3,800 to 4,200 feet
Mean annual precipitation: 30 to 36 inches
Frost-free period: 40 to 70 days

Composition

Major Components

Bata and similar soils: 90 percent

Minor Components

Upsata gravelly silt loam: 0 to 5 percent
Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Battlebutte Series

Depth class: Shallow
Drainage class: Well drained
Permeability: Moderate
Landform: Hills
Parent material: Material derived from semiconsolidated welded tuff
Slope range: 4 to 60 percent
Elevation: 2,600 to 3,700 feet
Annual precipitation: 15 to 22 inches
Annual air temperature: 39 to 43 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy, mixed, active, frigid,
shallow Typic Haploxerolls

Typical Pedon

Battlebutte gravelly loam, in an area of Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes, in an area of rangeland, 900 feet south and 250 feet west of the northeast corner of sec. 14, T. 24 N., R. 24 W.

A1—0 to 2 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; common very fine tubular pores; 20 percent hard pebbles; neutral; clear smooth boundary.

A2—2 to 8 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; common very fine tubular pores; 20 percent hard pebbles; neutral; clear smooth boundary.

Bw1—8 to 13 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; common very fine tubular pores; 20 percent hard pebbles, 10 percent soft fragments; neutral; clear smooth boundary.

Bw2—13 to 19 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine and few fine roots; 20 percent hard pebbles and 50 percent soft fragments; neutral; gradual smooth boundary.

Cr—19 to 60 inches; semiconsolidated welded tuff.

Range in Characteristics

Soil temperature: 41 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Cr horizon: 10 to 20 inches

Note: The Bw2 horizon is not present in all pedons.

A horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 50 percent—

15 to 35 percent hard pebbles; 0 to 15 percent soft fragments

Reaction: pH 6.1 to 7.3

Bw1 horizon

Hue: 10YR or 2.5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 6 moist

Chroma: 2, 3, 4, or 6

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 75 percent—

10 to 30 percent hard pebbles; 5 to 45 percent soft fragments

Reaction: pH 6.1 to 7.3

Bw2 horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Clay content: 10 to 27 percent

Content of rock fragments: 50 to 90 percent—

10 to 30 percent hard pebbles; 40 to 60 percent soft fragments

Reaction: pH 6.1 to 7.3

66F—Battlebutte gravelly loam, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 2,900 to 3,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Battlebutte and similar soils: 90 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

166E—Battlebutte-Bigdraw-Welded tuff outcrop complex, 15 to 30 percent slopes

Setting

Landform:

- Battlebutte—Hills
- Bigdraw—Hills

Slope:

- Battlebutte—15 to 30 percent
- Bigdraw—15 to 30 percent

Elevation: 2,900 to 3,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Battlebutte and similar soils: 50 percent

Bigdraw and similar soils: 20 percent

Areas of welded tuff outcrop: 20 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bigarm gravelly loam: 0 to 5 percent

Major Component Description

Battlebutte

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

Bigdraw

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 inches

Welded tuff outcrop

Definition: Areas of semiconsolidated volcanic ash and dust.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

166F—Battlebutte-Welded tuff outcrop complex, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 2,900 to 3,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Battlebutte and similar soils: 65 percent

Areas of welded tuff outcrop: 25 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Bigdraw gravelly loam: 0 to 5 percent

Major Component Description

Battlebutte

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

Welded tuff outcrop

Definition: Areas of semiconsolidated volcanic ash and dust.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

266E—Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes**Setting***Landform:*

- Battlebutte—Hills
- Bigdraw—Hills

Slope:

- Battlebutte—15 to 30 percent
- Bigdraw—15 to 30 percent

Elevation: 2,900 to 3,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition**Major Components**

Battlebutte and similar soils: 55 percent

Bigdraw and similar soils: 35 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Major Component Description**Battlebutte**

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

Bigdraw

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

366E—Battlebutte-Bigdraw gravelly loams, moist, 8 to 30 percent slopes**Setting***Landform:*

- Battlebutte—Hills
- Bigdraw—Hills

Position on landform:

- Battlebutte—Backslopes and side slopes
- Bigdraw—Footslopes

Slope:

- Battlebutte—8 to 30 percent
- Bigdraw—8 to 30 percent

Elevation: 3,200 to 3,700 feet

Mean annual precipitation: 19 to 22 inches

Frost-free period: 90 to 110 days

Composition**Major Components**

Battlebutte and similar soils: 50 percent

Bigdraw and similar soils: 40 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Major Component Description**Battlebutte**

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.6 inches

Bigdraw

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

366F—Battlebutte-Bigdraw gravelly loams, moist, 30 to 60 percent slopes

Setting

Landform:

- Battlebutte—Hills
- Bigdraw—Hills

Position on landform:

- Battlebutte—Backslopes and side slopes
- Bigdraw—Footslopes

Slope:

- Battlebutte—30 to 60 percent
- Bigdraw—30 to 50 percent

Elevation: 3,200 to 3,700 feet

Mean annual precipitation: 19 to 22 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Battlebutte and similar soils: 60 percent

Bigdraw and similar soils: 30 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Major Component Description

Battlebutte

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.6 inches

Bigdraw

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Beaverdump Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Stream terraces

Parent material: Volcanic ash over mixed alluvium and glacial outwash

Slope range: 0 to 35 percent

Elevation range: 2,200 to 2,800 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Vitrandic Hapludalfs

Typical Pedon

Beaverdump gravelly loam, 4 to 15 percent slopes, in an area of forestland, 1,800 feet south and 800 feet east of the northwest corner of sec. 8, T. 23 N., R. 30 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 3 inches; dark yellowish brown (10YR 4/4) gravelly loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 15 percent pebbles; slightly acid; clear wavy boundary.

Bw—3 to 10 inches; yellowish brown (10YR 5/4) gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 20 percent pebbles; moderately acid; clear wavy boundary.

2E/Bt—10 to 27 inches; E part (60 percent) is brown (10YR 5/3) very gravelly sandy loam, pale brown (10YR 6/3) dry; B part (40 percent) is dark yellowish brown (10YR 4/4) very gravelly sandy loam, yellowish brown (10YR 5/4) dry; moderate medium subangular blocky structure; slightly

hard, friable, slightly sticky, slightly plastic;
common fine, medium, and coarse roots;
common distinct clay films on faces of peds;
5 percent cobbles and 40 percent pebbles;
neutral; gradual irregular boundary.

2Bt/E—27 to 50 inches; B part (60 percent) is dark yellowish brown (10YR 4/4) very cobbly sandy loam, yellowish brown (10YR 5/4) dry; E part (40 percent) is brown (10YR 5/3) very cobbly sandy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; common distinct clay films on faces of peds; 25 percent cobbles and 35 percent pebbles; slightly acid; gradual irregular boundary.

2C—50 to 60 inches; pale brown (10YR 6/3) extremely cobbly loamy coarse sand, very pale brown (10YR 7/3) dry; single grain; loose, nonsticky, nonplastic; few fine and medium roots; 35 percent cobbles and 35 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 4 or 5 moist; 5 or 6 dry

Clay content: 8 to 15 percent

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 4 or 5 moist; 5 or 6 dry

Clay content: 8 to 15 percent

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

2E/Bt horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Clay content: 10 to 20 percent

Content of rock fragments: 40 to 60 percent—5 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

2Bt/E horizon

Value: B part: 5 or 6 dry, 4 or 5 moist; E part: 6 or 7 dry, 5 or 6 moist

Clay content: 10 to 20 percent

Content of rock fragments: 40 to 60 percent—15 to 25 percent cobbles; 25 to 35 percent pebbles

Reaction: pH 5.6 to 7.3

2C horizon

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Clay content: 5 to 15 percent

Content of rock fragments: 65 to 90 percent—25 to 35 percent cobbles; 35 to 55 percent pebbles

Reaction: pH 5.6 to 6.5

62B—Beaverdump gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,200 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Beaverdump and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

62D—Beaverdump gravelly loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,200 to 2,800 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Beaverdump and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

862E—Beaverdump gravelly loam, 15 to 35 percent slopes

Setting

Landform: Stream terraces
Position on landform: Dissected or incised treads
Slope: 15 to 35 percent
Elevation: 2,200 to 2,800 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Beaverdump and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
 Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Beeskove Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains and trough walls
Parent material: Colluvium derived from calcareous
 argillite and quartzite
Slope range: 4 to 80 percent
Elevation: 3,600 to 5,400 feet
Annual precipitation: 24 to 34 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Eutrudepts

Typical Pedon

Beeskove gravelly loam, 35 to 60 percent slopes, in an area of forestland, 300 feet south and 2,700 feet east of the northwest corner of sec. 15, T. 16 N., R. 21 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 8 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 25 percent pebbles; neutral; clear smooth boundary.

E/Bw—8 to 23 inches; E part (80 percent) is light brownish gray (2.5Y 6/2) very gravelly loam, dark grayish brown (2.5Y 4/2) moist; B part (20 percent) is light yellowish brown (2.5Y 6/4) very gravelly loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 45 percent pebbles; neutral; gradual wavy boundary.

Bw—23 to 40 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; 5 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

Bk—40 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common fine, medium, and coarse roots; 10 percent cobbles and 55 percent pebbles; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 8 and 24 inches

Depth to the Bk horizon: 20 to 40 inches

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.3

E/Bw horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: B part: 2, 3, or 4

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 55 percent—0 to 10 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

Bk horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 75 percent—5 to 10 percent cobbles; 55 to 65 percent pebbles

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.9 to 8.4

39F—Beeskove gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,200 to 5,400 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Beeskove and similar soils: 85 percent

Minor Components

Eaglewing gravelly loam: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

77D—Beeskove gravelly loam, moist, 4 to 15 percent slopes

Setting

Landform: Mountains

Slope: 4 to 15 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Beeskove and similar soils: 90 percent

Minor Components

Mollman gravelly loam, dry: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Slopes greater than 15 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

77E—Beeskove gravelly loam, moist, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,200 to 5,400 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Beeskove and similar soils: 90 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent

Beeskove moist, bouldery: 0 to 3 percent

Slopes greater than 35 percent: 0 to 2 percent

Felan gravelly silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

77F—Beeskove gravelly loam, moist, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,200 to 5,400 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Beeskove and similar soils: 90 percent

Minor Components

Mitten gravelly silt loam: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

771G—Beeskove-Mollman-Rock outcrop complex, 40 to 80 percent slopes

Setting

Landform:

- Beeskove—Glacial trough wall
- Mollman—Glacial trough wall

Slope:

- Beeskove—40 to 80 percent
- Mollman—40 to 60 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Beeskove and similar soils: 45 percent

Mollman and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Slopes less than 40 percent: 0 to 7 percent

Mollman, bouldery: 0 to 3 percent

Major Component Description

Beeskove

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

Mollman

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Belton Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Lake plains and terraces and stream terraces

Parent material: Lacustrine deposits

Slope range: 0 to 35 percent

Elevation: 2,500 to 3,500 feet

Annual air temperature: 42 to 45 degrees F

Annual precipitation: 15 to 19 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, illitic, frigid Typic Natrixerolls

Typical Pedon

Belton silt loam, 2 to 8 percent slopes, in an area of pasture, 1,400 feet north and 50 feet east of the southwest corner of sec. 21, T. 20 N., R. 24 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; neutral; clear smooth boundary.

B_{tn}1—8 to 17 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to strong fine and medium angular blocky; hard, firm, moderately sticky, moderately plastic; common fine and few medium roots; common distinct clay films on faces of peds; neutral; clear smooth boundary.

B_{tn}2—17 to 21 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate fine and medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common fine roots; few faint clay films on faces of peds;

slightly effervescent; neutral; clear smooth boundary.

Bkn—21 to 29 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common fine roots; common seams and masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—29 to 60 inches; very pale brown (10YR 7/3) silty clay, brown (10YR 5/3) moist; massive; distinct 1/8- to 1/4-inch thick varves; very hard, very firm, moderately sticky, moderately plastic; few fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the Bk horizon: 13 to 25 inches

Ap horizon

Value: 4 or 5 dry

Chroma: 2 or 3

Texture: Silt loam or fine sandy loam

Clay content: 8 to 27 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

Btn horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 8 to 13

Reaction: pH 6.6 to 7.8

Bkn horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 30 to 55 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 10 to 15 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.4 to 8.4

C horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 30 to 55 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 20 to 30

Reaction: pH 7.9 to 9.0

14A—Belton silt loam, 0 to 2 percent slopes

Setting

Landform: Lake plains and terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Belton and similar soils: 85 percent

Minor Components

Camascreek silt loam: 0 to 5 percent

Round Butte silty clay loam: 0 to 5 percent

Slopes greater than 2 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

14B—Belton silt loam, 2 to 8 percent slopes**Setting***Landform:* Lake plains and terraces*Slope:* 2 to 8 percent*Elevation:* 2,500 to 3,500 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Belton and similar soils: 85 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Camascreek silt loam: 0 to 5 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

14D—Belton silt loam, 8 to 15 percent slopes**Setting***Landform:* Lake plains and terraces*Slope:* 8 to 15 percent*Elevation:* 2,500 to 3,500 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Belton and similar soils: 90 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

14E—Belton silt loam, 15 to 35 percent slopes**Setting***Landform:* Lake plains and terraces*Slope:* 15 to 35 percent*Elevation:* 2,500 to 3,500 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Belton and similar soils: 85 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Areas of lake sediment outcrop: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bemishave Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains or terraces and escarpments

Parent material: Lacustrine and glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,400 to 2,800 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 125 days

Taxonomic Class: Fine, mixed, active, frigid Vitrandic Haploxeralfs

Typical Pedon

Bemishave loam, 0 to 4 percent slopes, in an area of cropland, 400 feet north and 2,500 feet east of the southwest corner of sec. 18, T. 20 N., R. 26 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many very fine and few fine, medium, and coarse roots; volcanic ash component; neutral; clear smooth boundary.

E/Bt—5 to 13 inches; E part (60 percent) is brown (10YR 5/3) loam, light gray (10YR 7/2) dry; B part (40 percent) is brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and few fine, medium, and coarse roots; volcanic ash component; few faint clay films on faces of peds; slightly acid; clear smooth boundary.

Bt—13 to 25 inches; brown (7.5YR 5/4) clay, light brown (7.5YR 6/4) dry; moderate coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and few fine, medium, and coarse roots;

few faint clay films on faces of peds; slightly acid; clear smooth boundary.

C—25 to 60 inches; reddish brown (5YR 5/3) clay, light reddish brown (5YR 6/3) dry; massive; $\frac{1}{16}$ - to $\frac{1}{4}$ -inch thick varves of clay; hard, firm, very sticky, very plastic; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Note: In the C horizon, varves range from $\frac{1}{16}$ - to $\frac{1}{2}$ -inch thick.

Ap horizon

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 10 to 25 percent

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.2 percent

Reaction: pH 6.1 to 7.3

E/Bt horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.2 percent

Reaction: pH 6.1 to 7.3

Bt horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 40 to 60 percent

Reaction: pH 6.1 to 7.3

C horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silty clay, clay, or silty clay loam

Clay content: 35 to 60 percent

Reaction: pH 6.6 to 7.3

28B—Bemishave loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 0 to 4 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Bemishave and similar soils: 90 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Bemishave stony loam: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bendahl Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines and mountains

Parent material: Volcanic ash over calcareous loamy glacial till

Slope range: 15 to 50 percent

Elevation range: 3,600 to 4,500 feet

Annual precipitation: 26 to 34 inches

Annual air temperature: 40 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Eutrudepts

Typical Pedon

Bendahl gravelly silt loam, 15 to 30 percent slopes, in an area of forestland, 2,300 feet north and 2,300 feet west of the southeast corner of sec. 12, T. 25 N., R. 27 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 1 inches; dark brown (10YR 4/3) gravelly silt loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic;

many fine and medium and few coarse roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

Bw—1 to 7 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure parting to moderate fine and medium granular; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; 20 percent pebbles; slightly acid; clear wavy boundary.

2E—7 to 17 inches; pale brown (10YR 6/3) very gravelly loam, light gray (10YR 7/2) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and common medium roots; 5 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

2E/Bw—17 to 27 inches; E part (60 percent) is pale brown (10YR 6/3) very gravelly loam, light gray (10YR 7/2) dry; B part (40 percent) is yellowish brown (10YR 5/4) very gravelly loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and common medium roots; 5 percent cobbles and 40 percent pebbles; slightly alkaline; gradual wavy boundary.

2Bk1—27 to 38 inches; light brownish gray (10YR 6/2) very gravelly loam, white (10YR 8/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 10 percent cobbles and 35 percent pebbles; disseminated lime; common distinct lime coatings on undersides of rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—38 to 60 inches; light brownish gray (10YR 6/2) very cobbly loam, white (10YR 8/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; 20 percent cobbles and 35 percent pebbles; disseminated lime; many distinct lime coatings on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 22 to 32 inches

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 20 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent
 Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist
 Clay content: 5 to 15 percent
 Content of rock fragments: 15 to 20 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent
 Reaction: pH 5.6 to 6.5

2E horizon

Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2 or 3
 Clay content: 10 to 27 percent
 Content of rock fragments: 35 to 45 percent—0 to 5 percent cobbles; 35 to 40 percent pebbles
 Reaction: pH 6.1 to 7.3

2E/Bw horizon

Hue: 10YR or 2.5Y
 Value: E part: 7 or 8 dry, 5 or 6 moist; B part: 6 or 7 dry, 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or sandy loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 40 to 55 percent—5 to 10 percent cobbles; 35 to 45 percent pebbles
 Reaction: pH 6.1 to 7.8

2Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or sandy loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 40 to 55 percent—10 to 15 percent cobbles; 30 to 40 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.9 to 8.4

2Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 7 or 8 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or sandy loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 50 to 65 percent—20 to 30 percent cobbles; 30 to 35 percent pebbles
 Calcium carbonate equivalent: 15 to 35 percent
 Reaction: pH 7.9 to 8.4

**98E—Bendahl gravelly silt loam,
15 to 30 percent slopes**

Setting

Landform: Moraines
Slope: 15 to 30 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Bendahl and similar soils: 90 percent

Minor Components

Mollman gravelly loam, dry: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**98F—Bendahl gravelly silt loam,
30 to 50 percent slopes**

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Bendahl and similar soils: 90 percent

Minor Components

Mollman gravelly loam, dry: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Berray Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains or terraces

Parent material: Volcanic ash over glaciolacustrine deposits

Slope range: 4 to 15 percent

Elevation range: 2,200 to 2,600 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Ashy over loamy, amorphic over mixed, active, frigid Alfic Udivitrands

Typical Pedon

Berray silt loam, 4 to 15 percent slopes, in an area of forestland, 600 feet north and 400 feet west of the southeast corner of sec. 9, T. 28 N., R. 33 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; dark brown (10YR 3/3) silt loam, (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium roots; volcanic ash component; moderately acid; gradual smooth boundary.

Bw1—1 to 8 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; moderately acid; gradual smooth boundary.

Bw2—8 to 16 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4)

dry; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few coarse roots; moderately acid; clear wavy boundary.

2E and Bt1—16 to 23 inches; E part (90 percent) is dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; soft, friable, nonsticky, nonplastic; common fine and few coarse roots; B part (10 percent) is dark yellowish brown (10YR 4/4) $\frac{1}{8}$ - to $\frac{3}{8}$ -inch thick discontinuous lamellae, light yellowish brown (10YR 6/4) dry moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and few coarse roots; moderately acid; clear wavy boundary.

2E and Bt2—23 to 39 inches; E part (85 percent) is dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; soft, friable, nonsticky, nonplastic; common fine and few coarse roots; moderately acid; B part (15 percent) is dark yellowish brown (10YR 4/4) $\frac{1}{8}$ - to $\frac{3}{4}$ -inch thick silt loam lamellae, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine and few coarse roots; moderately acid; gradual wavy boundary.

2E and Bt3—39 to 60 inches; E part (75 percent) is dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; soft, friable, nonsticky, nonplastic; few fine and coarse roots; moderately acid; B part (25 percent) is dark yellowish brown (10YR 4/4) $\frac{3}{8}$ - to 2-inch thick silt loam lamellae, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine and coarse roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Depth to the 2E horizon: 14 to 26 inches

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Phosphate retention: 25 to 75 percent

1,500 kPa water retention on air-dried samples: 8 to 12 percent

Note: The combined thickness of the A, Bw1, and Bw2 horizons is 14 to 26 inches.

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.0 g/cm³
 Reaction: pH 5.6 to 6.5

Bw1 horizon

Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 3 or 4
 Clay content: 2 to 10 percent
 Moist bulk density: 0.85 to 1.0 g/cm³
 Reaction: pH 5.6 to 6.5

Bw2 horizon

Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 3 or 4
 Clay content: 2 to 10 percent
 Moist bulk density: 0.85 to 1.0 g/cm³
 Reaction: pH 5.6 to 6.5

2E and Bt horizons

Hue: B part: 10YR or 7.5YR
 Value: B part: 5 or 6 dry
 Texture: Silt loam or very fine sandy loam
 Clay content: E part: 4 to 10 percent; B part: 8 to 18 percent
 Reaction: pH 5.1 to 6.0

94D—Berray silt loam, 4 to 15 percent slopes

Setting

Landform: Lake plains or terraces
Slope: 4 to 15 percent
Elevation: 2,200 to 2,600 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Berray and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
 Berray, gravelly substratum: 0 to 3 percent
 Tamarack moist: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over glaciolacustrine
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 11.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bigarm Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Alluvial fans, stream terraces, and hills
Parent material: Colluvium or alluvium derived from argillite and quartzite
Slope range: 2 to 60 percent
Elevation: 2,500 to 5,200 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haploxerolls

Typical Pedon

Bigarm cobbly loam, 30 to 60 percent slopes, in an area of rangeland, 2,150 feet south and 200 feet west of the northeast corner of sec. 32, T. 23 N., R. 24 W.

A1—0 to 5 inches; dark gray (10YR 4/1) cobbly loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; 15 percent cobbles and 10 percent pebbles; neutral; clear smooth boundary.

A2—5 to 17 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; 20 percent cobbles and 15 percent pebbles; neutral; clear smooth boundary.

Bw—17 to 38 inches; pale brown (10YR 6/3) very cobbly sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and few medium roots; 20 percent cobbles and 35 percent pebbles; neutral; gradual smooth boundary.

C—38 to 60 inches; pale brown (10YR 6/3) extremely cobbly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; few fine roots; 25 percent cobbles and 45 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the mollic epipedon: 8 to 20 inches

Note: Rock fragments in the control section are mainly argillite and quartzite. In some pedons, there is weakly calcareous material below a depth of 40 inches.

A horizons

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 7 to 18 percent

Content of rock fragments: 20 to 35 percent—0 to 20 percent cobbles; 10 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 5 to 18 percent

Content of rock fragments: 35 to 60 percent—0 to 20 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

C horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, sandy loam, or loamy sand

Clay content: 5 to 18 percent

Content of rock fragments: 40 to 80 percent—5 to 25 percent stones and cobbles; 35 to 60 percent pebbles

Reaction: pH 6.6 to 7.3

50B—Bigarm gravelly loam, 2 to 8 percent slopes**Setting**

Landform: Hills

Slope: 2 to 8 percent

Elevation: 2,600 to 4,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition**Major Components**

Bigarm and similar soils: 90 percent

Minor Components

Minesinger gravelly loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50D—Bigarm gravelly loam, 8 to 15 percent slopes**Setting**

Landform: Hills

Position on landform: Footslopes and toeslopes

Slope: 8 to 15 percent

Elevation: 2,600 to 4,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition**Major Components**

Bigarm and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Bigarm stony loam: 0 to 3 percent

Bigarm cobbly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50E—Bigarm gravelly loam, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 2,600 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Bigarm cobbly loam: 0 to 5 percent

Hogsby cobbly loam: 0 to 4 percent

Slopes greater than 30 percent: 0 to 4 percent

Areas of rock outcrop: 0 to 1 percent

Areas of rubble land: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

50F—Bigarm cobbly loam, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 2,600 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Hogsby cobbly loam: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Finleypoint gravelly loam: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52D—Bigarm gravelly loam, cool, 4 to 15 percent slopes

Setting

Landform: Hills

Position on landform: Footslopes and toeslopes

Slope: 4 to 15 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 4 percent

Hogsby cobbly loam: 0 to 4 percent

Slopes greater than 15 percent: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52E—Bigarm gravelly loam, cool, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 3,500 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bigarm cobbly loam, cool: 0 to 3 percent

Bigarm stony loam, cool: 0 to 2 percent

Hogsby cobbly loam: 0 to 2 percent

Areas of rubble land: 0 to 2 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

52F—Bigarm cobbly loam, cool, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 3,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Finleypoint gravelly loam: 0 to 5 percent

Areas of rubble land: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

148C—Bigarm gravelly loam, cool, 2 to 8 percent slopes, very stony

Setting

Landform: Hills

Position on landform: Footslopes and toeslopes

Slope: 2 to 8 percent

Elevation: 2,500 to 2,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 90 percent

Minor Components

Bigarm, cool, very bouldery: 0 to 4 percent
 Slopes greater than 8 percent: 0 to 4 percent
 Minesinger gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**148E—Bigarm gravelly loam, cool,
 8 to 25 percent slopes, very stony**

Setting

Landform: Hills
Position on landform: Backslopes, footslopes, and side slopes
Slope: 8 to 25 percent
Elevation: 2,500 to 2,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition**Major Components**

Bigarm and similar soils: 90 percent

Minor Components

Slopes greater than 25 percent: 0 to 5 percent
 Bigarm, cool, very bouldery: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**150E—Bigarm-Hogsby-Rock outcrop
 complex, 8 to 30 percent slopes**

Setting

Landform:
 • Bigarm—Hills
 • Hogsby—Hills
Slope:
 • Bigarm—8 to 30 percent
 • Hogsby—8 to 30 percent
Elevation: 2,600 to 4,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition**Major Components**

Bigarm and similar soils: 45 percent
 Hogsby and similar soils: 20 percent
 Rock outcrop: 20 percent

Minor Components

Slopes greater than 30 percent: 0 to 6 percent
 Areas of rubble land: 0 to 6 percent
 Bigarm, very stony: 0 to 3 percent

Major Component Description**Bigarm**

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Hogsby

Surface layer texture: Cobbly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

150F—Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes

Setting

Landform:

- Bigarm—Hills
- Hogsby—Hills

Slope:

- Bigarm—30 to 60 percent
- Hogsby—30 to 60 percent

Elevation: 2,600 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 40 percent

Hogsby and similar soils: 25 percent

Rock outcrop: 20 percent

Minor Components

Areas of rubble land: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Finleypoint gravelly loam: 0 to 5 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.8 inches

Hogsby

Surface layer texture: Cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

152E—Bigarm, cool-Hogsby-Rock outcrop complex, 8 to 30 percent slopes

Setting

Landform:

- Bigarm—Hills
- Hogsby—Hills

Slope:

- Bigarm—8 to 30 percent
- Hogsby—8 to 30 percent

Elevation: 3,200 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 55 percent

Hogsby and similar soils: 20 percent

Rock outcrop: 15 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.0 inches

Hogsby

Surface layer texture: Cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

152F—Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes

Setting

Landform:

- Bigarm—Hills
- Hogsby—Hills

Slope:

- Bigarm—30 to 60 percent
- Hogsby—30 to 60 percent

Elevation: 3,000 to 5,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 40 percent

Hogsby and similar soils: 25 percent

Rock outcrop: 20 percent

Minor Components

Areas of rubble land: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Finleypoint gravelly loam: 0 to 5 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Hogsby

Surface layer texture: Cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

250E—Bigarm-Rubble land complex, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 2,600 to 4,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 60 percent

Rubble land: 30 percent

Minor Components

Slopes greater than 30 percent: 0 to 4 percent

Hogsby cobbly loam: 0 to 3 percent

Areas of rock outcrop: 0 to 3 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

250F—Bigarm-Rubble land complex, 30 to 60 percent slopes

Setting

Landform: Hills
Slope: 30 to 60 percent
Elevation: 2,600 to 4,800 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 50 percent
 Rubble land: 35 percent

Minor Components

Hogsby cobbly loam: 0 to 4 percent
 Slopes greater than 60 percent: 0 to 4 percent
 Finleypoint gravelly loam: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.8 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

252E—Bigarm, cool-Rubble land complex, 15 to 30 percent slopes

Setting

Landform: Hills
Slope: 15 to 30 percent
Elevation: 3,200 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 60 percent
 Rubble land: 25 percent

Minor Components

Hogsby cobbly loam: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

252F—Bigarm, cool-Rubble land complex, 30 to 60 percent slopes

Setting

Landform: Hills
Slope: 30 to 60 percent
Elevation: 3,000 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Bigarm and similar soils: 55 percent
 Rubble land: 30 percent

Minor Components

Hogsby cobbly loam: 0 to 5 percent
 Slopes greater than 60 percent: 0 to 5 percent
 Finleypoint gravelly loam: 0 to 5 percent

Major Component Description

Bigarm

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

350B—Bigarm gravelly loam, alluvial, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,600 to 3,600 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Bigarm, alluvial, stony: 0 to 5 percent
 Yellowbay gravelly loam: 0 to 5 percent
 Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

350D—Bigarm gravelly loam, alluvial, 8 to 15 percent slopes

Setting

Landform: Hills
Position on landform: Footslopes and toeslopes
Slope: 8 to 15 percent
Elevation: 2,600 to 3,600 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Yellowbay gravelly loam: 0 to 5 percent

Bowlake gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

350E—Bigarm gravelly loam, alluvial, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 2,600 to 3,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Yellowbay gravelly loam: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

350F—Bigarm gravelly loam, alluvial, 30 to 50 percent slopes

Setting

Landform: Hills

Slope: 30 to 50 percent

Elevation: 2,600 to 3,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigarm and similar soils: 85 percent

Minor Components

Yellowbay gravelly loam: 0 to 5 percent

Slopes greater than 50 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 3 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bigbeaver Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,200 to 2,800 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Coarse-silty, mixed, superactive, acid, frigid Aeric Fluvaquents

Typical Pedon

Bigbeaver silt loam, 0 to 2 percent slopes, in an area of forestland, 2,100 feet south and 1,800 feet west of the northeast corner of sec. 36, T. 23 N., R. 31 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; slightly hard, friable, nonsticky, nonplastic; many very fine and fine roots; strongly acid; clear smooth boundary.

C1—4 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; few distinct yellowish brown (10YR 5/6) redox concentrations; moderate fine subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; many very fine and fine roots; strongly acid; clear smooth boundary.

C2—9 to 18 inches; brown (pH 5/3) silt loam, light gray (10YR 7/2) dry; few distinct yellowish brown (10YR 5/6) redox concentrations; massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; strongly acid; gradual wavy boundary.

C3—18 to 26 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; common distinct yellowish brown (10YR 5/6) redox concentrations; massive; slightly hard, friable, nonsticky, nonplastic; common very fine roots; very strongly acid; gradual wavy boundary.

C4—26 to 36 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; common distinct yellowish brown (10YR 5/6) redox concentrations; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots; strongly acid; gradual wavy boundary.

C5—36 to 60 inches; grayish brown (10YR 5/2) stratified silt loam, very fine sandy loam, and loam, light gray (10YR 7/2) dry; common distinct

yellowish brown (10YR 5/6) redox concentrations; massive; slightly hard, friable, nonsticky, nonplastic; few very fine roots; strongly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

C1 horizon

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

C2 horizon

Value: 5, 6, or 7 moist; 6, 7, or 8 dry

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

C3 horizon

Value: 5, 6, or 7 moist; 6, 7, or 8 dry

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

C4 horizon

Value: 5, 6, or 7 moist; 6, 7, or 8 dry

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

C5 horizon

Value: 5, 6, or 7 moist; 6, 7, or 8 dry

Texture: Stratified silt loam, very fine sandy loam, loam, fine sandy loam, or loamy fine sand

Clay content: 6 to 15 percent

Reaction: pH 4.5 to 5.5

66A—Bigbeaver silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,200 to 2,800 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 105 days

Composition

Major Components

Bigbeaver and similar soils: 90 percent

Minor Components

Oldtrail gravelly sandy loam: 0 to 4 percent
 Larchpoint silt loam: 0 to 4 percent
 Slopes greater than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

893A—Bigbeaver silt loam, 0 to 2 percent slopes, frequently flooded**Setting**

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,200 to 2,600 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 105 days

Composition**Major Components**

Bigbeaver and similar soils: 90 percent

Minor Components

Bigbeaver, channeled: 0 to 4 percent
 Ibex, occasionally flooded: 0 to 3 percent
 Slopes greater than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Frequent
Water table: Apparent
Available water capacity: Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bigdraw Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Hills
Parent material: Colluvium and residuum derived from semiconsolidated welded tuff
Slope range: 4 to 50 percent
Elevation: 2,600 to 3,700 feet
Annual air temperature: 39 to 43 degrees F
Annual precipitation: 15 to 22 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed, active, frigid
 Typic Argixerolls

Typical Pedon

Bigdraw gravelly loam, in an area of Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes, in an area of rangeland, 1,650 feet south and 200 feet west of the northeast corner of sec. 35, T. 25 N., R. 23 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; 25 percent hard pebbles; neutral; clear smooth boundary.

A2—3 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; common very fine tubular pores; 25 percent hard pebbles; slightly acid; clear smooth boundary.

Bt1—9 to 15 inches; pale brown (10YR 6/3) gravelly clay loam, brown (10YR 4/3) moist; moderate fine and medium angular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; common very fine and fine tubular pores; common prominent clay films on faces of peds and in pores; 5 percent hard cobbles and

15 percent hard pebbles; neutral; clear smooth boundary.

Bt2—15 to 20 inches; light yellowish brown (10YR 6/4) gravelly loam, yellowish brown (10YR 4/4) moist; strong fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common fine roots; common very fine and fine tubular pores; few faint clay films on faces of peds; 15 percent hard pebbles and 20 percent soft fragments; slightly effervescent, slightly alkaline; clear smooth boundary.

Bk—20 to 28 inches; very pale brown (10YR 7/3) coarse sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky, nonplastic; few fine roots; 10 percent hard pebbles and 45 percent soft fragments; common seams and masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—28 to 60 inches; semiconsolidated welded tuff.

Range in Characteristics

Soil temperature: 41 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Cr horizon: 20 to 40 inches

Depth to the Bk horizon: 12 to 28 inches (The lime in this series is believed to be contamination from Glacial Lake Missoula.)

Note: The moist phase generally lacks the lime contamination.

A horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 50 percent—
15 to 30 percent hard pebbles; 0 to 5 percent
hard cobbles; 0 to 15 percent soft fragments

Reaction: pH 6.1 to 7.3

Bt1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 3, 4, or 6

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 10 to 70 percent—
10 to 30 percent hard pebbles; 0 to 5 percent
hard cobbles; 0 to 35 percent soft fragments

Reaction: pH 6.1 to 7.3

Bt2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 3, 4, or 6

Texture: Clay loam or loam

Clay content: 20 to 35 percent

Content of rock fragments: 10 to 70 percent—
10 to 30 percent hard pebbles; 0 to 5 percent
hard cobbles; 0 to 35 percent soft fragments

Reaction: pH 7.4 to 7.8

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 3, 4, or 6

Texture: Coarse sandy loam or sandy loam

Clay content: 10 to 18 percent

Content of rock fragments: 35 to 60 percent—
10 to 15 percent hard pebbles; 25 to 45
percent soft fragments

Calcium carbonate equivalent: 3 to 10 percent

Reaction: pH 7.4 to 8.4

168D—Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes

Setting

Landform:

- Bigdraw—Hills
- Battlebutte—Hills

Position on landform:

- Bigdraw—Footslopes and toeslopes
- Battlebutte—Footslopes and toeslopes

Slope:

- Bigdraw—4 to 15 percent
- Battlebutte—4 to 15 percent

Elevation: 2,600 to 3,700 feet

Mean annual precipitation: 15 to 17 inches

Frost-free period: 90 to 120 days

Composition

Major Components

Bigdraw and similar soils: 60 percent

Battlebutte and similar soils: 30 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Major Component Description

Bigdraw

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 inches

Battlebutte*Surface layer texture:* Gravelly loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Tuff residuum*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 1.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Biglake Series*Depth class:* Very deep*Drainage class:* Excessively drained*Permeability:* Moderately rapid to 20 inches; rapid below this depth*Landform:* Alluvial fans, stream terraces, and drainageways*Parent material:* Alluvium*Slope range:* 0 to 8 percent*Elevation:* 2,500 to 3,200 feet*Annual precipitation:* 14 to 16 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 90 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Haploxerolls

Typical Pedon

Biglake gravelly loam, 0 to 8 percent slopes, in an area of rangeland, 1,600 feet south and 2,200 feet east of the northwest corner of sec. 27, T. 24 N., R. 24 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium and few coarse roots; 20 percent pebbles; neutral; clear wavy boundary.

Bw—9 to 20 inches; brown (10YR 5/3) very cobbly sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots;

20 percent cobbles and 30 percent pebbles; neutral; clear wavy boundary.

C—20 to 60 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; 20 percent cobbles and 50 percent pebbles; neutral.

Range in Characteristics*Soil temperature:* 43 to 47 degrees F*Moisture control section:* Between 12 and 35 inches*Thickness of the mollic epipedon:* 8 to 16 inches**A horizon**

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—5 to 20 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 6.6 to 7.3

C horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 60 to 80 percent—10 to 20 percent stones and cobbles; 50 to 60 percent pebbles

Reaction: pH 6.6 to 7.3

91B—Biglake gravelly loam, 0 to 8 percent slopes**Setting***Landform:* Alluvial fans, stream terraces, and drainageways*Slope:* 0 to 8 percent*Elevation:* 2,500 to 3,200 feet*Mean annual precipitation:* 14 to 16 inches*Frost-free period:* 90 to 120 days**Composition****Major Components**

Biglake and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 4 percent

Biglake very cobbly loam: 0 to 4 percent

Bowlake gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bignell Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Stream terraces and mountains

Parent material: Colluvium from tertiary sediments

Slope range: 0 to 35 percent

Elevation range: 2,600 to 4,000 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Bignell gravelly loam, 4 to 15 percent slopes, in an area of forestland, 300 feet north and 1,300 feet west of the southeast corner of sec. 14, T. 21 N., R. 26 W.

Oi—1 to 0 inches; partially decomposed forest litter.

E—0 to 8 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium roots; 30 percent pebbles; moderately acid; clear wavy boundary.

E/Bt—8 to 19 inches; E part (80 percent) is pink (7.5YR 7/3) gravelly loam, brown (7.5YR 5/3) moist; B part (20 percent) is light brown (7.5YR 6/3) gravelly clay loam, brown (7.5YR 4/3) moist;

moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few distinct clay films on faces of peds; common very fine, fine, and medium roots; 5 percent cobbles and 25 percent pebbles; slightly acid; gradual irregular boundary.

Bt/E—19 to 31 inches; B part (60 percent) is brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; E part (40 percent) is light brown (7.5YR 6/3) gravelly loam, brown (10YR 5/3) moist; strong fine and medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common distinct clay films on faces of peds and pebbles; common very fine, fine, medium, and coarse roots; 5 percent cobbles and 25 percent pebbles; slightly acid; clear wavy boundary.

Bt—31 to 60 inches; brown (7.5YR 5/4) very gravelly clay, dark brown (7.5YR 4/4) moist; strong fine and medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common distinct clay films on faces of peds and pebbles; few very fine, fine, medium, and coarse roots; 10 percent cobbles and 45 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 4 and 12 inches

E horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 60 percent—0 to 30 percent cobbles; 10 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

E/Bt and Bt/E horizons

Hue: 7.5YR or 10YR

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5, 6, or 7 dry

Chroma: E part: 2, 3, or 4; B part: 2, 4, or 6

Texture: Loam, sandy clay loam, or clay loam

Clay content: 10 to 35 percent

Content of rock fragments: 25 to 60 percent—0 to 25 percent cobbles; 15 to 55 percent pebbles

Reaction: pH 5.1 to 6.5

Bt horizon

Hue: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Clay, sandy clay, or clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 35 to 60 percent—0 to 30 percent cobbles; 20 to 45 percent pebbles
Reaction: pH 5.1 to 6.5

82B—Bignell gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 2,600 to 4,000 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 90 percent

Minor Components

Rumblecreek gravelly loam: 0 to 5 percent
Slopes greater than 4 percent: 0 to 3 percent
Iffgulch and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Tertiary age sediments
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82D—Bignell gravelly loam, 4 to 15 percent slopes

Setting

Landform: Mountains
Position on landform: Backslopes, footslopes, and side slopes
Slope: 4 to 15 percent
Elevation: 2,600 to 4,000 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
Bignell gravelly loam, stony: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Tertiary age sediments
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82E—Bignell gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Position on landform: Backslopes
Slope: 15 to 35 percent
Elevation: 2,600 to 4,000 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Bignell and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent
Bignell gravelly loam, stony: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Tertiary age sediments
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Blackcreek Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Stream terraces and outwash plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 3,300 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-silty, mixed, superactive, calcareous, frigid Typic Endoaquepts

Typical Pedon

Blackcreek silt loam, 0 to 2 percent slopes, in an area of forestland, 300 feet south and 2,300 feet east of the northwest corner of sec. 5, T. 26 N., R. 27 W.

A—0 to 4 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; neutral; clear wavy boundary.

Bw—4 to 10 inches; dark gray (10YR 4/1) silt, gray (10YR 6/1) dry; weak medium platy structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; neutral; gradual wavy boundary.

Bk—10 to 27 inches; olive gray (5Y 5/2) silt loam, light gray (5Y 7/2) dry; few fine faint dark brown (10YR 4/3) redox concentrations; weak medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few medium roots; few fine masses of lime; slightly effervescent; slightly alkaline; gradual wavy boundary.

C1—27 to 36 inches; gray (5Y 6/1) silt, white (5Y 8/1) dry; common fine distinct dark brown (10YR 4/3) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; slightly effervescent; moderately alkaline; gradual wavy boundary.

C2—36 to 42 inches; light gray (5Y 7/2) silt, white (5Y 8/2) dry; many prominent medium yellowish brown (10YR 5/6) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; neutral; gradual wavy boundary.

2C3—42 to 60 inches; gray (10YR 5/1) stratified loamy coarse sand and silt, light gray (10YR 6/1) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; slightly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 2 or 3 moist; 3 or 4 dry

Clay content: 12 to 18 percent

Reaction: pH 5.6 to 7.3

Bw horizon

Value: 3 or 4 moist; 5 or 6 dry

Texture: Silt or silt loam

Clay content: 8 to 12 percent

Reaction: pH 6.1 to 7.3

Bk horizon

Value: 5 or 6 moist; 6 or 7 dry

Clay content: 8 to 12 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C1 horizon

Value: 6 or 7 moist; 7 or 8 dry

Texture: Silt or silt loam

Clay content: 8 to 12 percent

Reaction: pH 7.4 to 8.4

C2 horizon

Value: 6 or 7 moist; 7 or 8 dry

Texture: Silt or silt loam

Clay content: 0 to 10 percent

Reaction: pH 5.6 to 7.3

2C3 horizon

Value: 5 or 6 moist; 6 or 7 dry

Clay content: 0 to 10 percent

Reaction: pH 5.6 to 7.3

74A—Blackcreek silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces and outwash plains

Slope: 0 to 2 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Blackcreek and similar soils: 90 percent

Minor Components

Tallcreek silt loam: 0 to 5 percent

Meadowpeak, occasionally flooded: 0 to 4 percent

Slopes greater than 2 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Blacklake Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderate

Landform: Closed depressions

Parent material: Alluvium

Slope range: 0 to 1 percent

Elevation range: 3,300 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-silty, mixed, superactive, nonacid, frigid Histic Humaquepts

Typical Pedon

Blacklake mucky peat, 0 to 1 percent slopes, in an area of wet meadow hayland, 400 feet north and 1,000 feet east of the southwest corner of sec. 7, T. 26 N., R. 26 W. (Flathead County, Montana)

Oe—0 to 9 inches; very dark brown (10YR 2/2) broken face and rubbed mucky peat (hemic

material); 70 percent fiber and raw herbaceous material—30 percent rubbed; weak thin platy structure parting to weak fine granular; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; moderately acid; clear smooth boundary.

Oe/C—9 to 14 inches; stratified black (10YR 2/1) broken face and rubbed mucky peat (hemic material) 80 percent fiber and raw herbaceous material—30 percent rubbed (80 percent) and very dark gray (10YR 3/1) mucky silt loam (20 percent); moderate thin platy structure parting to moderate fine granular; slightly hard, very friable, nonsticky, nonplastic; many very fine and fine roots; moderately acid; abrupt wavy boundary.

C/Oa—14 to 31 inches; stratified very dark grayish brown (10YR 3/2) mucky silt loam (70 percent) and dark gray (10YR 4/1) silt loam (20 percent) and black (10YR 2/1) muck (10 percent); weak medium subangular blocky structure parting to weak very fine granular; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; moderately acid; clear wavy boundary.

C—31 to 57 inches; stratified light brownish gray (10YR 6/2) very fine sandy loam and silt loam (70 percent) and light gray (10YR 7/2) silt (30 percent); massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; moderately acid; abrupt wavy boundary.

C/Oa'—57 to 60 inches; stratified very dark gray (10YR 3/1) mucky silt loam (80 percent) and black (10YR 2/1) muck (20 percent); massive; slightly hard, friable, slightly sticky, slightly plastic; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Thickness of organic material: 8 to 16 inches

Depth to the seasonal high water table: 0 to 12 inches

Oe horizon

Value: 2 or 3

Chroma: 1 or 2

Fiber content: 50 to 80 percent unrubbed; 20 to 30 percent rubbed

Reaction: pH 5.6 to 7.3

Oe/C horizon

Value: Oe part: 2 or 3; C part: 2 or 3 moist

Chroma: Oe part: 1 or 2; C part: 1 or 2

Fiber content: 50 to 80 percent unrubbed; 20 to 30 percent rubbed

Reaction: pH 5.6 to 7.3

Texture: Silt loam or mucky silt loam

Clay content: 5 to 15 percent

Reaction: pH 5.6 to 7.3

C/Oa and C/Oa' horizons

Hue: C part: 10YR or 2.5Y

Value: C part: 2, 3, 4, or 5

Chroma: C part: 1 or 2

Texture: C part: Silt loam, mucky silt loam, silt, or very fine sandy loam

Clay content: C part: 4 to 12 percent

Reaction: C part: pH 5.6 to 6.5; Oa' part: pH 5.6 to 6.5

Fiber content: Oa' part: 30 to 50 percent unrubbed; less than 20 percent rubbed

C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7

Chroma: 1 or 2

Texture: Silt, very fine sandy loam, or silt loam

Clay content: 4 to 12 percent

Reaction: pH 5.6 to 6.5

**72A—Blacklake mucky peat,
0 to 1 percent slopes**

Setting

Landform: Closed depressions

Slope: 0 to 1 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Blacklake and similar soils: 90 percent

Minor Components

McLangor mucky peat: 0 to 8 percent

Meadowpeak, occasionally flooded: 0 to 2 percent

Major Component Description

Surface layer texture: Mucky-peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Apparent

Available water capacity: Mainly 14.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bohnlly Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,500 to 3,500 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Typic Endoaquolls

Typical Pedon

Bohnlly silt loam, 0 to 2 percent slopes, in an area of pasture, 800 feet north and 1,400 feet west of the southeast corner of sec. 10, T. 23 N., R. 24 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.

Bw—8 to 13 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; neutral; gradual smooth boundary.

Cg1—13 to 28 inches; dark gray (5Y 4/1) silty clay loam, gray (5Y 6/1) dry; common fine distinct strong brown (7.5YR 5/6) redox concentrations; massive; slightly hard, friable, moderately sticky, moderately plastic; neutral; gradual smooth boundary.

Cg2—28 to 60 inches; gray (5Y 5/1) silty clay loam, light gray (5Y 7/1) dry; common fine distinct strong brown (7.5YR 5/8) redox concentrations; massive; slightly hard, friable, moderately sticky, moderately plastic; neutral.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the seasonal high water table: 6 to 24 inches

A horizon

Value: 2 or 3 moist; 4 or 5 dry
 Chroma: 1 or 2
 Clay content: 18 to 27 percent
 Reaction: pH 6.6 to 7.3

Bw horizon

Value: 4 or 5 moist; 5 or 6 dry
 Chroma: 1 or 2
 Texture: Silt loam or silty clay loam
 Clay content: 18 to 32 percent
 Reaction: pH 6.6 to 7.3

Cg horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 or 5 moist; 5, 6, or 7 dry
 Texture: Silt loam or silty clay loam
 Clay content: 18 to 32 percent
 Reaction: pH 6.6 to 7.3

10A—Bohnlly silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,500 to 3,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Bohnlly and similar soils: 85 percent

Minor Components

Sonyok silty clay loam: 0 to 5 percent
 Camascreek silt loam: 0 to 4 percent
 Bolack silt loam: 0 to 3 percent
 Aeris Haplaquepts: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 11.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bolack Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation: 2,500 to 3,000 feet
Annual precipitation: 12 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine, mixed, superactive, frigid
 Typic Endoaquolls

Typical Pedon

Bolack silt loam, 0 to 2 percent slopes, in an area of pasture, 900 feet south and 600 feet west of the northeast corner of sec. 18, T. 22 N., R. 23 W.

A—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; many very fine, fine, and medium and few coarse roots; neutral; clear wavy boundary.

Bg1—7 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 6/1) dry; weak coarse prismatic structure parting to strong fine subangular blocky; hard, very firm, very sticky, very plastic; common very fine and fine roots; neutral; gradual wavy boundary.

Bg2—10 to 16 inches; dark gray (10YR 4/1) silty clay, gray (10YR 6/1) dry; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, very firm, very sticky, very plastic; few very fine roots; neutral; gradual wavy boundary.

C1—16 to 35 inches; grayish brown (2.5Y 5/2) silty clay, light brownish gray (2.5Y 6/2) dry; common fine distinct strong brown (7.5YR 5/6) redox concentrations; massive; hard, very firm, very sticky, very plastic; slightly alkaline; gradual wavy boundary.

C2—35 to 60 inches; grayish brown (2.5Y 5/2) silty clay, light gray (2.5Y 7/2) dry; common fine distinct strong brown (7.5YR 5/8) redox concentrations; massive; hard, very firm, very

sticky, very plastic; slightly effervescent;
moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 20 inches

Depth to the seasonal high water table: 12 to
24 inches

A horizon

Value: 2 or 3 moist; 3, 4, or 5 dry

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.3

Bg horizons

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 1 or 2

Texture: Silty clay or silty clay loam

Clay content: 27 to 45 percent

Reaction: pH 6.6 to 7.3

C horizons

Hue: 2.5Y, 5Y, or N

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 0, 1, or 2

Texture: Clay or silty clay

Clay content: 40 to 50 percent

Reaction: pH 7.4 to 8.4

11A—Bolack silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Bolack and similar soils: 85 percent

Minor Components

Sonyok silty clay loam: 0 to 9 percent

Camascreek silt loam: 0 to 4 percent

Areas of open water: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 9.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bonnash Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Volcanic ash over mixed alluvium and glacial outwash

Slope range: 0 to 35 percent

Elevation range: 2,200 to 2,600 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Ashy over loamy-skeletal, amorphic over mixed, superactive, frigid Typic Udivitrands

Typical Pedon

Bonnash gravelly silt loam, 0 to 4 percent slopes, in an area of forestland, 1,000 feet north and 900 feet west of the southeast corner of sec. 16, T. 23 N., R. 30 W.

Oi—2 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; clear wavy boundary.

Bw1—3 to 14 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, yellowish brown (10YR 5/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; gradual wavy boundary.

Bw2—14 to 24 inches; yellowish brown (10YR 5/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; gradual irregular boundary.

2E/Bw—24 to 35 inches; E part (60 percent) is yellowish brown (10YR 5/4) very gravelly sandy loam, light yellowish brown (10YR 6/4) dry; Bw part (40 percent) is dark yellowish brown (10YR 4/6) very gravelly sandy loam, yellowish brown (10YR 5/6) dry; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; 10 percent cobbles and 30 percent pebbles; moderately acid; clear wavy boundary.

2C—35 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loamy coarse sand, light yellowish brown (10YR 6/4) dry; single grain; loose, nonsticky, nonplastic; few fine, medium, and coarse roots; 25 percent cobbles and 40 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Volcanic ash mantle: 14- to 28-inches thick

Volcanic glass content in the 0.02 to 2.0 mm fraction:
5 to 30 percent

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 2.0 percent

Phosphate retention: 25 to 90 percent

15-bar water retention on air-dried samples: 5 to 12 percent

A horizon

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 10 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

Bw horizons

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 10 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: E part: 5, 6, or 7 dry, 4, 5, or 6 moist;

B part: 4, 5, or 6 dry, 3, 4, or 5 moist

Clay content: 2 to 10 percent

Content of rock fragments: 35 to 55 percent—5 to 15 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

2C horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: 2 to 10 percent

Content of rock fragments: 60 to 90 percent—20 to 40 percent cobbles; 40 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

60B—Bonnash gravelly silt loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Bonnash and similar soils: 90 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Glaciercreek: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

860D—Bonnash gravelly silt loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,200 to 2,600 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Bonnash and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
 Glaciercreek: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

860E—Bonnash gravelly silt loam, 15 to 35 percent slopes

Setting

Landform: Stream terraces
Position on landform: Risers
Slope: 15 to 35 percent
Elevation: 2,200 to 2,600 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Bonnash and similar soils: 85 percent

Minor Components

Slopes greater than 35 percent: 0 to 9 percent
 Glaciercreek: 0 to 6 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Bowlake Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans, stream terraces, drainageways, and giant ripple marks
Parent material: Tertiary sediments and alluvium
Slope range: 0 to 8 percent
Elevation: 2,800 to 3,400 feet
Annual precipitation: 13 to 16 inches
Annual air temperature: 39 to 43 degrees F
Frost-free period: 100 to 125 days

Taxonomic Class: Fine, illitic, frigid Calcic Argixerolls

Typical Pedon

Bowlake gravelly loam in an area of Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes, in an area of pasture, 40 feet south and 2,400 feet west of the northeast corner of sec. 10, T. 19 N., R. 24 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and common medium and coarse roots; 15 percent pebbles; neutral; clear smooth boundary.

AB—7 to 9 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate thin platy structure; soft, very friable,

slightly sticky, slightly plastic; many fine and few medium roots; 20 percent pebbles; neutral; clear smooth boundary.

Bt—9 to 24 inches; pale brown (10YR 6/3) gravelly silty clay, brown (10YR 4/3) moist; strong fine and medium angular blocky structure; hard, firm, moderately sticky, very plastic; common fine roots; common distinct clay films on faces of peds and lining pores; 20 percent pebbles; neutral; gradual smooth boundary.

Bk—24 to 60 inches; light yellowish brown (10YR 6/4) gravelly silty clay, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; hard, very firm, moderately sticky, very plastic; few fine roots; 25 percent pebbles; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches

Soil temperature: 41 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 18 to 35 inches

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 15 to 30 percent—0 to 5 percent stones; 0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 6.6 to 7.3

AB horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 40 percent

Content of rock fragments: 5 to 30 percent—0 to 5 percent stones; 0 to 5 percent cobbles; 5 to 20 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 60 percent

Content of rock fragments: 5 to 25 percent—0 to 5 percent cobbles; 5 to 20 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 40 to 45 percent

Content of rock fragments: 5 to 50 percent—0 to 10 percent cobbles; 5 to 40 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

56A—Bowlake gravelly loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 2 percent

Elevation: 2,800 to 2,900 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Bowlake and similar soils: 85 percent

Minor Components

Remount very gravelly loam: 0 to 5 percent

Camascreek silt loam: 0 to 5 percent

Slopes greater than 2 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

56B—Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes

Setting

Landform:

- Bowlake—Alluvial fans
- Minesinger—Alluvial fans

Position on landform:

- Bowlake—Backslopes, footslopes, and side slopes
- Minesinger—Backslopes, footslopes, and side slopes

Slope:

- Bowlake—2 to 8 percent
- Minesinger—2 to 8 percent

Elevation: 2,900 to 3,400 feet*Mean annual precipitation:* 14 to 16 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Bowlake and similar soils: 55 percent

Minesinger and similar soils: 30 percent

Minor Components

Camascreek silt loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Minesinger stony loam: 0 to 5 percent

Major Component Description**Bowlake***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Tertiary age sediments*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 6.8 inches**Minesinger***Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Tertiary age sediments*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Cabinet Series*Depth class:* Very deep*Drainage class:* Moderately well drained*Permeability:* Very slow*Landform:* Lake plains or terraces*Parent material:* Volcanic ash over glaciolacustrine deposits*Slope range:* 4 to 30 percent*Elevation range:* 2,200 to 2,700 feet*Annual precipitation:* 28 to 34 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 90 to 105 days

Taxonomic Class: Clayey over loamy, mixed, active, frigid Andic Hapludalfs

Typical Pedon

Cabinet silt loam, in an area of Cabinet silt loam, 4 to 15 percent slopes, in an area of forestland, $\frac{1}{4}$ -mile west of the Montana state line along a paved road about 20 feet south of the road, 1,150 feet north and 800 feet west of the southeast corner, sec. 34, T. 55 N., R. 3 E. (Bonner County, Idaho)

Oi—0.5 to 0 inches; undecomposed and decomposed forest litter.

A—0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, nonsticky, slightly plastic; many very fine and fine and few medium roots; many very fine and common fine tubular pores; slightly acid; clear wavy boundary.

Bw—3 to 11 inches; light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common very fine and few fine and medium roots; common very fine and few fine tubular pores; slightly acid; abrupt wavy boundary.

2E/Bt—11 to 19 inches; E part (80 percent) is white (10YR 8/2) silty clay loam, brown (10YR 5/3) moist; B part (20 percent) is pink (7.5YR 7/4) clay, brown (7.5YR 5/4) moist; moderate coarse prismatic structure parting to moderate medium and coarse angular blocky; very hard, very firm, slightly sticky, moderately plastic; common very fine and few roots matted on the exterior of peds; common very fine and few fine tubular pores; many distinct clay films in pores and on faces of peds; few fine manganese concretions; strongly acid; clear wavy boundary.

2Bt1—19 to 27 inches; pink (7.5YR 7/4) clay, brown (7.5YR 5/4) moist; moderate very coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; few very fine and fine roots matted on exterior of peds; few very fine and fine tubular pores; many distinct clay films in

pores and on faces of peds; few fine manganese concretions and stains; reddish gray (5YR 5/2) coats on faces of peds; very strongly acid; gradual wavy boundary.

2Bt2—27 to 35 inches; pink (7.5YR 7/4) clay, reddish brown (5YR 5/3) moist; weak very coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, extremely firm, very sticky, very plastic; few very fine and fine roots matted on exterior of peds; few very fine and fine tubular pores; many distinct clay films in pores and on faces of peds; common medium manganese stains; pinkish gray (5YR 6/2) and brown (7.5YR 5/4) coats on faces of peds; very strongly acid; abrupt wavy boundary.

3Bt3—35 to 43 inches; pink (7.5YR 7/4) very fine sandy loam, light reddish brown (5YR 6/3) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine and fine roots; few very fine and fine tubular and irregular pores; few thin clay bridges between mineral grains; few fine manganese stains; 1/4-inch thick discontinuous band of iron stain across horizon; brown (7.5YR 5/4) and pinkish gray (7.5YR 6/2) coats on faces of peds; very strongly acid; abrupt wavy boundary.

3Bt4—43 to 49 inches; pink (7.5YR 7/4) clay, light reddish brown (5YR 6/3) moist; weak coarse subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine and fine roots; very few fine vesicular pores; common distinct clay films in pores and on faces of peds; common medium and large distinct light gray (5YR 7/1) and pinkish gray (5YR 6/2) moist iron depletions; many medium manganese stains; many medium silt coats on faces of peds; strongly acid; abrupt wavy boundary.

3Bt5—49 to 54 inches; pink (7.5YR 7/4) loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few very fine irregular pores; few thin clay bridges between mineral grains; common medium manganese stains; strongly acid; abrupt wavy boundary.

3Bt6—54 to 60 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 5/4) dry; weak coarse subangular blocky structure; very hard, very firm, very sticky, very plastic; few very fine vesicular pores; common distinct clay films in pores and on faces of peds; many large manganese stains; strongly acid.

Range in Characteristics

Soil temperature: 43 to 45 degrees F

Moisture control section: Between 4 and 12 inches
Depth to the seasonal perched water table: 10 to 24 inches, February through April

A horizon

Chroma: 2 or 3 moist
Moist bulk density: 0.85 to 1.0 g/cm³
Acid oxalate extractable Al + 1/2Fe: 1 to 2 percent
Reaction: pH 5.6 to 7.3

Bw horizon

Hue: 10YR or 7.5YR
Value: 4 or 5 moist
Chroma: 3 to 6
Moist bulk density: 0.85 to 1.0 g/cm³
Acid oxalate extractable Al + 1/2Fe: 1 to 2 percent
Reaction: pH 5.6 to 7.3

2E/Bt horizon

Chroma: 2 or 3
Texture: Silt loam, silty clay loam, or clay
Base saturation by sum of cations: 45 to 60 percent
Reaction: pH 5.1 to 6.0

2Bt horizons

Hue: 10YR, 7.5YR, or 5YR
Value: 4 to 7 moist
Chroma: 2 to 4 dry
Coatings on faces of peds: Hue: 5YR or 7.5YR;
Value: 5 to 7 dry, 4 to 7 moist; Chroma: 2 to 6 moist
Texture: Clay or silty clay
Base saturation by sum of cations: 50 to 60 percent
Reaction: pH 4.5 to 6.0

3Bt horizons

Hue: 5YR or 7.5YR
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 3 or 4 dry or moist
Coatings on faces of peds and redox features:
Hue: 5YR or 7.5YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4 dry or moist
Texture: Stratified very fine sandy loam to clay
Reaction: pH 4.5 to 6.0

Camascreek Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Very slow
Landform: Alluvial fans, stream terraces, and drainageways
Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,700 to 2,900 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine, mixed, superactive, frigid
Aquic Natrixerolls

Typical Pedon

Camascreek silt loam, 0 to 2 percent slopes, in an area of rangeland, 250 feet north and 1,750 feet east of the southwest corner of sec. 26, T. 20 N., R. 24 W.

A1—0 to 8 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and common medium roots; many very fine and fine pores; disseminated lime; strongly effervescent; very strongly alkaline; clear smooth boundary.

A2—8 to 15 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to strong very fine and fine angular blocky; slightly hard, firm, slightly sticky, moderately plastic; common fine and medium and few coarse roots; few very fine pores; disseminated lime; violently effervescent; strongly alkaline; clear smooth boundary.

Btnk1—15 to 23 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; weak medium prismatic structure parting to strong fine and medium angular and subangular blocky; very hard, very firm, moderately sticky, very plastic; few fine roots; common very fine and fine pores; common distinct clay films on faces of peds and in pores; common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Btnk2—23 to 43 inches; pale brown (10YR 6/3) silty clay, brown (10YR 4/3) moist; common faint grayish brown (2.5Y 5/2) redox depletions; weak medium and coarse subangular blocky structure; hard, very firm, moderately sticky, very plastic; few fine roots; common fine and medium pores; few distinct clay films on faces of peds; common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; light yellowish brown (10YR 6/4) silty clay, dark yellowish brown (10YR 4/4) moist; common distinct grayish brown (2.5Y 5/2) redox depletions; massive; very hard, very firm, moderately sticky, very plastic; few fine pores; disseminated lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: 24 to 42 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Btnk horizon: 10 to 20 inches

Note: In some pedons, 1 to 2 inches of the surface layer is noncalcareous, but, when mixed to 7 inches, the surface layer is calcareous throughout.

A1 horizon

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 20 to 27 percent

Calcium carbonate equivalent: 3 to 10 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 8.5 to 9.6

A2 horizon

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 13 to 30

Reaction: pH 8.5 to 9.0

Btnk1 horizon

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 3 or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Calcium carbonate equivalent: 3 to 8 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.9 to 9.0

Btnk2 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 3 or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 1 to 3 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 5 to 13

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Chroma: 1, 2, 3, or 4

Texture: Silty clay or silty clay loam
 Clay content: 35 to 55 percent
 Electrical conductivity (mmhos/cm): 0 to 4
 Sodium adsorption ratio: 0 to 13
 Reaction: pH 7.4 to 8.4

90A—Camascreek silt loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 2 percent
Elevation: 2,700 to 2,900 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Camascreek and similar soils: 90 percent

Minor Components

Marklepass silty clay loam: 0 to 4 percent
 Sonyok silty clay loam: 0 to 3 percent
 Slopes greater than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Clearcreek Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent

Elevation: 2,500 to 3,000 feet
Annual precipitation: 12 to 14 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine-silty, mixed, superactive, nonacid, frigid Oxyaquic Xerofluvents

Typical Pedon

Clearcreek silt loam, 0 to 2 percent slopes, in an area of pasture, 3,230 feet south and 300 feet east of the northwest corner of sec. 29, T. 20 N., R. 22 W.

- A—0 to 6 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many fine and coarse and common medium roots; few fine interstitial and tubular pores; slightly alkaline; clear smooth boundary.
- C1—6 to 16 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium platy structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and few medium and coarse roots; few fine tubular pores; slightly alkaline; clear smooth boundary.
- C2—16 to 35 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common fine and few medium roots; common tubular pores; slightly alkaline; gradual smooth boundary.
- C3—35 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, moderately sticky, moderately plastic; few fine and medium roots; few fine pores; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to the seasonal high water table: 42 to 60 percent

A horizon

Hue: 2.5Y or 10YR
 Value: 3 or 4 moist; 5 or 6 dry
 Chroma: 2 or 3
 Clay content: 10 to 27 percent
 Reaction: pH 6.6 to 7.8

C1 horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 moist; 6 or 7 dry
 Chroma: 2 or 3

Clay content: 10 to 27 percent
Reaction: pH 6.6 to 7.8

C2 and C3 horizons

Hue: 2.5Y or 10YR
Value: 4 or 5 moist; 6 or 7 dry
Chroma: 2 or 3
Texture: Silty clay loam or silt loam
Clay content: 18 to 35 percent
Reaction: pH 7.4 to 8.4

96A—Clearcreek silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,500 to 3,000 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Clearcreek and similar soils: 85 percent

Minor Components

Aeric Haplaquepts: 0 to 5 percent
Camascreek silt loam: 0 to 5 percent
Marklepass silty clay loam: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 11.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Combest Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Mountains and stream terraces

Parent material: Volcanic ash over colluvium

Slope range: 4 to 70 percent

Elevation range: 2,400 to 5,000 feet

Annual precipitation: 19 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Haplustepts

Typical Pedon

Combest gravelly silt loam, 35 to 60 percent slopes, in an area of forestland, 1,800 feet north and 800 feet west of the southeast corner of sec. 28, T. 20 N., R. 27 W.

Oi—2 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 2 inches; very dark brown (10YR 2/2) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; volcanic ash component; 20 percent pebbles; neutral; clear smooth boundary.

Bw—2 to 10 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; 30 percent pebbles; slightly acid; abrupt wavy boundary.

2E—10 to 24 inches; grayish brown (10YR 5/2) very gravelly sandy loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium and coarse roots; 15 percent cobbles and 40 percent pebbles; slightly acid; gradual wavy boundary.

2E/Bw—24 to 60 inches; E part (80 percent) is grayish brown (10YR 5/2) extremely cobbly sandy loam, light gray (10YR 7/2) dry; E part surrounds the B part; B part (20 percent) is brown (10YR 5/3) extremely cobbly sandy loam, pale brown (10YR 6/3) dry; massive; soft, very friable, nonsticky, nonplastic; few very fine, fine, and medium roots; 30 percent cobbles and 40 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent
 Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 35 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent
 Reaction: pH 5.6 to 6.5

Bw horizon

Clay content: 5 to 15 percent
 Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
 Moist bulk density: 0.85 to 1.0 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.00 to 1.25 percent
 Reaction: pH 5.6 to 6.5

2E horizon

Value: 6 or 7 dry
 Chroma: 1, 2, or 3
 Texture: Sandy loam or loam
 Clay content: 5 to 10 percent
 Content of rock fragments: 35 to 75 percent—10 to 20 percent cobbles; 25 to 55 percent pebbles
 Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist
 Chroma: E part: 2 or 3; B part: 3 or 4
 Texture: Sandy loam or loam
 Clay content: 5 to 10 percent
 Content of rock fragments: 60 to 80 percent—30 to 40 percent cobbles; 30 to 40 percent pebbles
 Reaction: pH 5.6 to 6.5

21E—Combest gravelly silt loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Combest and similar soils: 90 percent

Minor Components

Winkler gravelly loam: 0 to 5 percent
 Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

21F—Combest gravelly silt loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Combest and similar soils: 85 percent

Minor Components

Winkler gravelly loam: 0 to 5 percent
 Slopes greater than 60 percent: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Areas of rubble land: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

211G—Combest-Rubble land complex, 40 to 70 percent slopes

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Combest and similar soils: 60 percent
Rubble land: 25 percent

Minor Components

Sharrott gravelly loam: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Slopes greater than 70 percent: 0 to 5 percent

Major Component Description

Combest

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.3 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

821D—Combest gravelly silt loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,400 to 2,600 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Combest and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Flooding: None
Available water capacity: Mainly 4.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Courvash Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Ground moraines
Parent material: Volcanic ash over glacial till
Slope range: 4 to 35 percent
Elevation range: 2,200 to 2,600 feet
Annual precipitation: 28 to 34 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Ashy over loamy-skeletal, amorphic over mixed, superactive, frigid Alfic Udivitrands

Typical Pedon

Courvash cobbly silt loam (mixed), 4 to 15 percent slopes, in an area of forestland, 2,400 feet south and 200 feet west of the northeast corner of sec. 10, T. 27 N., R. 33 W.

Oi—1 inch to 0; undecomposed and slightly decomposed needles and twigs.

A—0 to 1 inch; very dark brown (10YR 2/2) gravelly silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium roots; 15 percent pebbles; moderately acid; abrupt wavy boundary.

Bw1—1 to 9 inches; dark yellowish brown (10YR 3/4) cobbly silt loam, yellowish brown (10YR 5/4) dry; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; 10 percent cobbles and 20 percent pebbles; moderately acid; gradual wavy boundary.

Bw2—9 to 17 inches; dark yellowish brown (10YR 4/4) cobbly silt loam, light yellowish brown (10YR 6/4) dry; weak very fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium roots; 20 percent cobbles and 10 percent pebbles; moderately acid; clear smooth boundary.

2E—17 to 30 inches; pale brown (10YR 6/3) very cobbly loam, very pale brown (10YR 8/3) dry; weak very fine granular structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots; trace stones, 30 percent cobbles, and 15 percent pebbles; moderately acid; gradual wavy boundary.

2Bt/E—30 to 42 inches; B part (60 percent) is dark yellowish brown (10YR 4/4) very cobbly loam, light yellowish brown (10YR 6/4) dry; E part (40 percent) is pale brown (10YR 6/3) very cobbly loam, very pale brown (10YR 8/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine and medium roots; few distinct clay films on faces of peds and in pores; 5 percent stones, 30 percent cobbles, and 15 percent pebbles; moderately acid; gradual wavy boundary.

2Bt—42 to 60 inches; dark yellowish brown (10YR 4/4) very cobbly clay loam, light yellowish brown (10YR 6/4) dry; moderate fine angular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine and medium roots; common distinct clay films on faces of peds and in pores; 5 percent stones, 35 percent cobbles, and 15 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Depth to the 2E horizon: 16 to 25 inches

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Phosphate retention: 25 to 75 percent

Note: The combined thickness of the A, Bw1, and Bw2 horizons is 16 to 25 inches.

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2, 3, or 4

Clay content: 2 to 10 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³

Reaction: pH 5.6 to 6.5

Bw1 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Content of rock fragments: 15 to 35 percent—10 to 15 percent cobbles; 5 to 20 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³

Reaction: pH 5.6 to 6.5

Bw2 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Content of rock fragments: 15 to 35 percent—10 to 20 percent cobbles; 5 to 15 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³

Reaction: pH 5.6 to 6.5

2E horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Loam, silt loam, or fine sandy loam

Clay content: 12 to 20 percent

Content of rock fragments: 35 to 60 percent—
trace stones; 20 to 30 percent cobbles; 15 to
30 percent pebbles

Reaction: pH 5.1 to 6.0

2Bt/E horizon

Value: B part: 6 or 7 dry, 4 or 5 moist; E part: 7 or
8 dry, 5 or 6 moist

Chroma: B part: 4 or 6; E part: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 27 percent

Content of rock fragments: 35 to 60 percent—0 to
5 percent stones; 20 to 30 percent cobbles;
15 to 25 percent pebbles

Reaction: pH 5.1 to 6.0

2Bt horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 4 or 6

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to
5 percent stones; 20 to 35 percent cobbles;
15 to 20 percent pebbles

Reaction: pH 5.1 to 6.0

**96D—Courvash cobbly silt loam,
4 to 15 percent slopes**

Setting

Landform: Moraines

Slope: 4 to 15 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Courvash and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 4 percent

Dewberry gravelly silt loam: 0 to 3 percent

Courville gravelly silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Cobbly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.2 inches

A typical soil description with range in
characteristics is included, in alphabetical
order, in this section.

Management

For management information about this map unit,
see appropriate sections in Part II of this publication.

**96E—Courvash cobbly silt loam,
15 to 35 percent slopes**

Setting

Landform: Moraines

Slope: 15 to 35 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Courvash and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Courville gravelly silt loam: 0 to 3 percent

Glaciercreek: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.2 inches

A typical soil description with range in
characteristics is included, in alphabetical
order, in this section.

Management

For management information about this map unit,
see appropriate sections in Part II of this publication.

Courville Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines and mountains

Parent material: Volcanic ash over glacial till or glacial
drift

Slope range: 2 to 60 percent

Elevation: 3,600 to 5,500 feet

Annual precipitation: 24 to 34 inches

Annual air temperature: 38 to 43 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Eutrudepts

Typical Pedon

Courville gravelly silt loam, 8 to 30 percent slopes, in an area of forestland, 1,600 feet north and 2,500 feet west of the southeast corner of sec. 8, T. 17 N., R. 22 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

Bw—0 to 8 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium and few coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; clear wavy boundary.

2E—8 to 32 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 10 percent cobbles and 30 percent pebbles; neutral; gradual smooth boundary.

2E/Bw—32 to 60 inches; E part (70 percent) is very pale brown (10YR 7/3) very gravelly loam, brown (10YR 5/3) moist; B part (30 percent) is pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; 15 percent cobbles and 35 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 14 inches

Bw horizon

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Moist bulk density: 0.85 to 1.0 g/cm³

Reaction: pH 5.6 to 6.5

2E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, sandy loam, or fine sandy loam

Clay content: 5 to 18 percent

Content of rock fragments: 35 to 60 percent—10 to 20 percent stones and cobbles; 25 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

2E/Bw horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, fine sandy loam, or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent—5 to 15 percent stones and cobbles; 30 to 45 percent pebbles

Reaction: pH 6.1 to 7.3

22C—Courville gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Moraines

Slope: 2 to 8 percent

Elevation: 3,600 to 4,500 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Courville and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 5 percent

Waldbillig gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

35E—Courville gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Moraines
Slope: 8 to 30 percent
Elevation: 3,900 to 5,500 feet
Mean annual precipitation: 28 to 32 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Courville and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent
 Waldbillig gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

35F—Courville gravelly silt loam, 30 to 50 percent slopes

Setting

Landform: Moraines
Slope: 30 to 50 percent
Elevation: 3,900 to 5,500 feet
Mean annual precipitation: 28 to 32 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Courville and similar soils: 90 percent

Minor Components

Waldbillig gravelly silt loam: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

221F—Courville-Rockhill-Rock outcrop complex, 30 to 50 percent slopes

Setting

Landform:
 • Courville—Mountains
 • Rockhill—Mountains
Slope:
 • Courville—30 to 50 percent
 • Rockhill—30 to 60 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 24 to 32 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Courville and similar soils: 45 percent
 Rockhill and similar soils: 25 percent
 Rock outcrop: 15 percent

Minor Components

Mitten gravelly silt loam: 0 to 10 percent
 Rubble land: 0 to 5 percent

Major Component Description

Courville

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.5 inches

Rockhill

Surface layer texture: Very gravelly silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.7 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

222F—Courville gravelly silt loam, dry, 30 to 50 percent slopes

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,600 to 5,200 feet
Mean annual precipitation: 24 to 32 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Courville and similar soils: 90 percent

Minor Components

Mitten gravelly silt loam, dry: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Crystalex Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Stream terraces and outwash plains
Parent material: Wind-modified alluvium
Slope range: 0 to 60 percent
Elevation range: 3,300 to 3,800 feet
Annual precipitation: 24 to 30 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Lamellic Hapludalfs

Typical Pedon

Crystalex loamy coarse sand, in an area of Tamarack-Crystalex complex, 4 to 15 percent slopes, in an area of forestland, 300 feet north and 1,600 feet east of the southwest corner of sec. 19, T. 27 N., R. 27 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.
 E1—0 to 9 inches; brown (10YR 5/3) loamy coarse sand, very pale brown (10YR 7/3) dry; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; slightly acid; gradual wavy boundary.

E2—9 to 21 inches; grayish brown (2.5 5/2) loamy coarse sand, light gray (2.5Y 7/2) dry; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and medium and few coarse roots; slightly acid; gradual wavy boundary.

E and Bt1—21 to 37 inches; E part (80 percent) is grayish brown (2.5Y 5/2) loamy sand, light gray (2.5Y 7/2) dry; B part (20 percent) is dark brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry, broken discontinuous lamellae $\frac{1}{8}$ - to $\frac{1}{4}$ -inch thick; weak coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium and few coarse roots; few faint clay films on faces of peds; moderately acid; gradual wavy boundary.

E and Bt2—37 to 60 inches; E part (60 percent) is grayish brown (2.5Y 5/2) loamy sand, light gray (2.5Y 7/2) dry; B part (40 percent) is dark brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry, broken discontinuous lamellae $\frac{3}{8}$ - to $\frac{1}{2}$ -inch thick; weak coarse subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common medium and few coarse roots; common faint clay films on faces of peds; slightly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

E horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 0 to 5 percent

Reaction: pH 5.6 to 7.3

E and Bt horizons

Hue: 10YR or 2.5Y

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: E part: 0 to 5 percent; B part: 5 to 10 percent

Reaction: pH 5.6 to 7.3

DA—Denied access

Composition

Major Components

Denied access: 100 percent

Major Component Description

Definition: Areas where mapping access permission was denied by the landowner

DAM—Dam

Composition

Major Components

Dam: 100 percent

Major Component Description

Definition: A barrier built to hold back flowing water.

Dewberry Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Volcanic ash over alluvium

Slope range: 2 to 45 percent

Elevation range: 2,200 to 2,600 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Ashy over loamy-skeletal, amorphic over mixed, superactive, frigid Typic Udivitrands

Typical Pedon

Dewberry silt loam, 2 to 8 percent slopes, in an area of forestland, 400 feet south and 2,300 feet west of the northeast corner of sec. 29, T. 26 N., R. 32 W.

Oi—1 inch to 0; slightly decomposed forest litter.

A—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; 10 percent pebbles; slightly acid; abrupt wavy boundary.

Bw1—1 to 9 inches; dark yellowish brown (10YR 3/4) silt loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; 10 percent pebbles; moderately acid; gradual wavy boundary.

Bw2—9 to 23 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; 5 percent cobbles and 20 percent pebbles; moderately acid; gradual wavy boundary.

2C1—23 to 38 inches; brown (10YR 5/3) extremely cobbly coarse sandy loam, very pale brown (10YR 7/3) dry; massive; loose, nonsticky, nonplastic; common fine and medium and few coarse roots; 30 percent cobbles and 40 percent pebbles; moderately acid; gradual wavy boundary.

2C2—38 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sandy loam, light gray (10YR 7/2) dry; massive; loose, nonsticky, nonplastic; common medium and few coarse roots; 20 percent cobbles and 50 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Volcanic glass content in the 0.02 to 2.0 mm fraction: 12 to 20 percent

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.60 to 2.25 percent

Phosphate retention: 25 to 75 percent

15-bar water retention on air-dried samples: 8 to 12 percent

A horizon

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

Bw1 horizon

Hue: 7.5YR or 10YR

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

Bw2 horizon

Hue: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.1 to 6.5

2C1 horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Clay content: 2 to 10 percent

Content of rock fragments: 60 to 80 percent—25 to 30 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

2C2 horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Clay content: 2 to 10 percent

Content of rock fragments: 60 to 80 percent—10 to 20 percent cobbles; 50 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

88C—Dewberry silt loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dewberry and similar soils: 90 percent

Minor Components

Glaciercreek: 0 to 5 percent

Tamarack moist: 0 to 3 percent

Slopes greater than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

88E—Dewberry gravelly silt loam, 8 to 45 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 8 to 45 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Dewberry and similar soils: 90 percent

Minor Components

Glaciercreek: 0 to 6 percent

Dewberry cobbly silt loam: 0 to 3 percent

Slopes greater than 45 percent: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Doglake Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid to 2C horizon; very rapid below this depth

Landform: Giant ripple marks

Parent material: Alluvium

Slope range: 2 to 12 percent

Elevation: 3,400 to 3,700 feet

Annual precipitation: 19 to 21 inches

Annual air temperature: 40 to 42 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal over fragmental, mixed, superactive, frigid Typic Haplustepts

Typical Pedon

Doglake extremely cobbly loam, 2 to 12 percent slopes, in an area of forestland, 2,300 feet south and 2,850 feet east of the northwest corner of sec. 4, T. 20 N., R. 25 W.

A—0 to 4 inches; brown (10YR 5/3) extremely cobbly loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky, nonplastic; many fine and few medium roots; 50 percent cobbles and 30 percent pebbles; slightly acid; clear smooth boundary.

Bw1—4 to 12 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; few very fine and fine roots; few fine pores; 55 percent cobbles and 30 percent pebbles; neutral; gradual smooth boundary.

Bw2—12 to 22 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine roots; few fine pores; 55 percent cobbles and 30 percent pebbles; neutral; gradual wavy boundary.

2C—22 to 60 inches; 60 percent cobbles and 35 percent pebbles.

Range in Characteristics

Soil temperature: 41 to 43 degrees F

Depth to the fragmental material: 20 to 36 inches

Note: When mixed to 7 inches, the surface layer fails to meet the requirements of a mollic epipedon.

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 60 to 85 percent—
35 to 50 percent cobbles; 25 to 35 percent
pebbles

Reaction: pH 6.1 to 7.3

Bw1 horizon

Value: 6 or 7 dry; 5 or 6 moist

Clay content: 10 to 18 percent

Content of rock fragments: 70 to 90 percent—
50 to 60 percent cobbles; 20 to 30 percent
pebbles

Reaction: pH 6.1 to 7.3

Bw2 horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 70 to 90 percent—
50 to 60 percent cobbles; 20 to 30 percent
pebbles

Reaction: pH 6.1 to 7.3

2C horizon

Content of rock fragments: 95 to 100 percent—
60 to 70 percent cobbles; 35 to 40 percent
pebbles

98C—Doglake extremely cobbly loam, 2 to 12 percent slopes

Setting

Landform: Giant ripple marks

Slope: 2 to 12 percent

Elevation: 3,400 to 3,700 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Doglake and similar soils: 90 percent

Minor Components

Slopes greater than 12 percent: 0 to 5 percent

Doglake, very stony: 0 to 5 percent

Major Component Description

Surface layer texture: Extremely cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 0.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dryfork Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 0 to 15 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-silty, mixed, active, frigid
Calcic Haploxerepts

Typical Pedon

Dryfork silt loam, in an area of Dryfork-Kerrdam silt loams, 4 to 15 percent slopes, in an area of rangeland, 1,900 feet south and 500 feet east of the northwest corner of sec. 26, T. 23 N., R. 24 W.

A—0 to 6 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, friable, slightly sticky, nonplastic; many fine and few coarse roots; neutral; clear smooth boundary.

Bw—6 to 16 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; strong medium subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; common fine roots; moderately alkaline; clear smooth boundary.

Bk1—16 to 23 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; moderate medium subangular blocky structure; hard, friable, nonsticky, nonplastic; few fine roots; disseminated lime; few fine masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bk2—23 to 31 inches; light gray (2.5Y 7/2) silt loam, pale yellow (2.5Y 7/4) moist; massive; slightly hard, very friable, nonsticky, nonplastic; disseminated lime; few fine masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

C—31 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 11 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 15 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.3

Bw horizon

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Clay content: 10 to 18 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

Bk horizons

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4 moist

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

C horizon

Hue: 5Y, 2.5Y, or 10YR

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Texture: Silt loam or very fine sandy loam

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 4 to 30

Reaction: pH 7.9 to 9.0

18B—Dryfork silt loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Dryfork and similar soils: 90 percent

Minor Components

Kerrdam silt loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

118B—Dryfork-Selow silt loams, 0 to 4 percent slopes

Setting

Landform:

- Dryfork—Lake plains or terraces

- Selow—Lake plains or terraces

Slope:

- Dryfork—0 to 4 percent

- Selow—0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Dryfork and similar soils: 45 percent

Selow and similar soils: 40 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Lonepine silt loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description**Dryfork**

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 10.3 inches

Selow

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**118D—Dryfork-Kerrdam silt loams,
4 to 15 percent slopes****Setting***Landform:*

- Dryfork—Lake plains or terraces
- Kerrdam—Lake plains or terraces

Slope:

- Dryfork—4 to 15 percent
- Kerrdam—4 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Dryfork and similar soils: 45 percent
 Kerrdam and similar soils: 40 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent
 Lonepine silt loam: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent

Major Component Description**Dryfork**

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 10.3 inches

Kerrdam

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**218D—Dryfork-Selow silt loams,
4 to 15 percent slopes****Setting***Landform:*

- Dryfork—Lake plains or terraces
- Selow—Lake plains or terraces

Slope:

- Dryfork—4 to 15 percent
- Selow—4 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Dryfork and similar soils: 45 percent
 Selow and similar soils: 40 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent
 Lonepine silt loam: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Dryfork

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 10.3 inches

Selow

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Dubay Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 30 percent

Elevation range: 2,300 to 2,800 feet

Annual precipitation: 17 to 19 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-silty, mixed, superactive, frigid Lamellic Haploxerepts

Typical Pedon

Dubay silt loam, 0 to 4 percent slopes, in an area of forestland, 500 feet south and 1,550 feet east of the northwest corner of sec. 5, T. 20 N., R. 27 W.

Oi—1 to 0 inches; partially decomposed organic matter.

A—0 to 3 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak coarse granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; moderately acid; abrupt smooth boundary.

E—3 to 8 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; strongly acid; clear smooth boundary.

E and Bw—8 to 40 inches; E part (80 percent) is pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; B part (20 percent) is brown (10YR 5/3) 1/8- to 1/2-inch thick silt loam lamellae, dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky, slightly plastic; few very fine, fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

C—40 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky, slightly plastic; few very fine and fine roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 10 to 18 percent

Reaction: pH 5.6 to 7.3

E horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 5.1 to 7.3

E and Bw horizon

Value: E part: 6 or 7 dry, 4, 5, or 6 moist;

B part:

5 or 6 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 2, 3, or 4

Clay content: 5 to 15 percent

Reaction: pH 5.6 to 7.3

C horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Reaction: pH 5.6 to 7.8

24B—Dubay silt loam, 0 to 4 percent slopes**Setting**

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 2,300 to 2,800 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Dubay and similar soils: 90 percent

Minor Components

Selon fine sandy loam, moist: 0 to 5 percent
 Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

24D—Dubay silt loam, 4 to 15 percent slopes**Setting**

Landform: Stream terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,300 to 2,500 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Dubay and similar soils: 90 percent

Minor Components

Selon fine sandy loam, moist: 0 to 4 percent
 Slopes greater than 15 percent: 0 to 4 percent
 Aeris Haplaquepts: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

824E—Dubay silt loam, 15 to 30 percent slopes**Setting**

Landform: Stream terraces
Position on landform: Dissected or incised treads
Slope: 15 to 30 percent
Elevation: 2,300 to 2,800 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Dubay and similar soils: 90 percent

Minor Components

Selon fine sandy loam, moist: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 11.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Eaglewing Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Colluvium from argillite or quartzite
Slope range: 8 to 50 percent
Elevation: 3,400 to 5,200 feet
Annual precipitation: 19 to 22 inches
Annual air temperature: 40 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Calcic Haplustepts

Typical Pedon

Eaglewing gravelly loam, 30 to 50 percent slopes, in an area of forestland, 1,700 feet south and 1,050 feet west of the northeast corner of sec. 2, T. 16 N., R. 21 W.

Oi—1 inch to 0; partially decomposed forest litter.

E—0 to 7 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, common medium, and few coarse roots; 20 percent pebbles; neutral; clear smooth boundary.

E/Bw—7 to 16 inches; E part (75 percent) is light yellowish brown (2.5Y 6/4) gravelly loam, light olive brown (2.5Y 5/4) moist; B part (25 percent) is light olive brown (2.5Y 5/4) gravelly loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and few medium and coarse roots; 25 percent pebbles; neutral; clear smooth boundary.

Bk1—16 to 28 inches; light gray (10YR 7/2) gravelly loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and few medium roots; 25 percent pebbles; disseminated lime; few fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—28 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine and medium roots; 10 percent cobbles and 30 percent pebbles; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 13 to 20 inches

E horizon

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent stones; 0 to 5 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

E/Bw horizon

Hue: 10YR or 2.5Y

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent stones; 0 to 5 percent cobbles; 5 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

Bk1 horizon

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent stones; 0 to 5 percent cobbles; 5 to 25 percent pebbles

Calcium carbonate equivalent: 20 to 40 percent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silt loam or loam

Clay content: 15 to 27 percent
 Content of rock fragments: 5 to 45 percent—0 to 5 percent stones; 0 to 10 percent cobbles; 5 to 30 percent pebbles
 Calcium carbonate equivalent: 20 to 40 percent
 Reaction: pH 7.9 to 9.0

28E—Eaglewing gravelly loam, 8 to 30 percent slopes

Setting

Landform: Mountains
Slope: 8 to 30 percent
Elevation: 3,400 to 5,200 feet
Mean annual precipitation: 19 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Eaglewing and similar soils: 90 percent

Minor Components

Repp gravelly loam: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Calcareous argillite or quartzite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

28F—Eaglewing gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,400 to 5,200 feet

Mean annual precipitation: 19 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Eaglewing and similar soils: 90 percent

Minor Components

Repp gravelly loam: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Calcareous argillite or quartzite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Elkrock Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 60 percent
Elevation range: 2,400 to 2,900 feet
Annual precipitation: 17 to 24 inches
Annual air temperature: 43 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Vitrandic Haploxerepts

Typical Pedon

Elkrock cobbly silt loam, 2 to 6 percent slopes, in an area of forestland, 1,500 feet south and 2,400 feet west of the northeast corner of sec. 17, T. 20 N., R. 26 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 2 inches; very dark gray (10YR 3/1) cobbly silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and common coarse roots; 15 percent cobbles and 10 percent pebbles; slightly acid; clear wavy boundary.

Bw—2 to 13 inches; brown (10YR 5/3) very gravelly silt loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and common coarse roots; 15 percent cobbles and 35 percent pebbles; moderately acid; clear wavy boundary.

2C—13 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, very pale brown (10YR 7/3) dry; massive; soft, very friable, slightly sticky, slightly plastic; few very fine, fine, medium, and coarse roots; 40 percent cobbles and 30 percent pebbles; moderately acid (pH 5.8).

Range in Characteristics

Soil temperature: 45 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 1 or 2

Clay content: 7 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 10 to 15 percent pebbles

Moist bulk density: 1.05 to 1.30 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, or sandy loam

Clay content: 7 to 20 percent

Content of rock fragments: 35 to 60 percent—5 to 15 percent cobbles; 30 to 45 percent pebbles

Moist bulk density: 1.00 to 1.30 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.2 percent

Reaction: pH 5.6 to 7.3

2C horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 7 to 20 percent

Content of rock fragments: 60 to 80 percent—30 to 40 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

47C—Elkrock cobbly silt loam, 2 to 6 percent slopes, stony

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 6 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Elkrock, bouldery: 0 to 5 percent

Slopes greater than 6 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

47D—Elkrock gravelly silt loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Elkrock stony silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

471D—Elkrock cobbly silt loam, 4 to 15 percent slopes, extremely bouldery

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Cobbly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

472B—Elkrock gravelly silt loam, moist, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 20 to 24 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Elkrock stony silt loam, moist: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

472D—Elkrock gravelly silt loam, moist, 4 to 15 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,400 to 2,900 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Elkrock stony silt loam, moist: 0 to 4 percent
 Slopes greater than 15 percent: 0 to 4 percent
 Sacheen loamy fine sand: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

472F—Elkrock gravelly silt loam, moist, 30 to 60 percent slopes

Setting

Landform: Stream terraces
Position on landform: Risers
Slope: 30 to 60 percent
Elevation: 2,400 to 2,800 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 90 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent
 Elkrock stony silt loam, moist: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

473D—Elkrock-Selon complex, 4 to 15 percent slopes

Setting

Landform:
 • Elkrock—Stream terraces
 • Selon—Stream terraces
Position on landform:
 • Elkrock—Treads
 • Selon—Treads
Slope:
 • Elkrock—4 to 15 percent
 • Selon—4 to 15 percent
Elevation: 2,400 to 2,800 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Elkrock and similar soils: 50 percent
 Selon and similar soils: 35 percent

Minor Components

Elkrock stony silt loam, moist: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 4 percent
 Bemishave loam: 0 to 3 percent
 Sacheen loamy fine sand: 0 to 3 percent

Major Component Description

Elkrock

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

Selon

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Felan Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Volcanic ash over colluvium

Slope range: 15 to 60 percent

Elevation: 3,600 to 6,200 feet

Annual precipitation: 30 to 50 inches

Annual air temperature: 37 to 42 degrees F

Frost-free period: 30 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Haplocryalfs

Typical Pedon

Felan gravelly silt loam, 35 to 60 percent slopes, in an area of forestland, 400 feet north and 2,400 feet west of the southeast corner of sec. 15, T. 16 N., R. 21 W.

Oi—2 inches to 0; partially decomposed forest litter.

Bw—0 to 8 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium roots; 25 percent pebbles; slightly acid; clear smooth boundary.

2E—8 to 20 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable,

nonsticky, slightly plastic; many very fine, fine, and medium roots; 40 percent pebbles; neutral; gradual wavy boundary.

2Bt—20 to 45 inches; light yellowish brown (2.5Y 6/4) extremely gravelly loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine, fine, and medium roots; common faint clay bridging of sand grains; 10 percent cobbles and 60 percent pebbles; neutral; gradual wavy boundary.

2Bk—45 to 60 inches; white (2.5Y 8/2) extremely gravelly loam, light gray (2.5Y 7/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; 10 percent cobbles and 60 percent pebbles; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 10 inches

Depth to the Bk horizon: 40 to 60 inches

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Clay content: 5 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Moist bulk density: 1.0 g/cm³ or less

Reaction: pH 5.1 to 6.5

2E horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 70 percent—0 to 10 percent cobbles, 35 to 60 percent pebbles

Reaction: pH 5.1 to 7.3

2Bt horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 20 percent

Content of rock fragments: 40 to 70 percent—0 to 10 percent cobbles; 40 to 60 percent pebbles

Reaction: pH 6.6 to 7.8

2Bk horizon

Hue: 2.5Y or 10YR

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2 or 3
 Clay content: 10 to 20 percent
 Content of rock fragments: 40 to 70 percent—0 to 10 percent stones and cobbles; 40 to 60 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

46F—Felan gravelly silt loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 5,000 to 6,200 feet
Mean annual precipitation: 36 to 45 inches
Frost-free period: 40 to 60 days

Composition

Major Components

Felan and similar soils: 85 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent
 Beeskove gravelly loam: 0 to 5 percent
 Holloway gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

76E—Felan gravelly silt loam, moist, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 3,600 to 5,600 feet

Mean annual precipitation: 30 to 50 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Felan and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Holloway gravelly silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

76F—Felan gravelly silt loam, moist, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,600 to 5,600 feet
Mean annual precipitation: 30 to 50 inches
Frost-free period: 30 to 70 days

Composition

Major Components

Felan and similar soils: 90 percent

Minor Components

Upsata gravelly silt loam: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Holloway gravelly silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Fernline Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains or terraces

Parent material: Volcanic ash over glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,200 to 2,800 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine, mixed, active, frigid Andic Hapludalfs

Typical Pedon

Fernline silt loam, 0 to 4 percent slopes, in an area of forestland, 1,900 feet north and 500 feet west of the southeast corner of sec. 33, T. 26 N., R. 32 W.

Oi—2 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; moderately acid; clear wavy boundary.

Bw—1 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; moderately acid; clear wavy boundary.

2E—9 to 14 inches; brown (10YR 5/3) silty clay loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic;

common very fine and fine roots; moderately acid; gradual wavy boundary.

2Bt/E—14 to 21 inches; B part (60 percent) is brown (7.5YR 5/4) silty clay, pink (7.5YR 7/4) dry; E part (40 percent) is brown (10YR 5/3) silty clay, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; few distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

2Bt—21 to 34 inches; brown (7.5YR 5/4) and pinkish gray (7.5YR 6/2) silty clay, pink (7.5YR 7/4) and pinkish white (7.5YR 8/2) dry; strong medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

2C—34 to 60 inches; brown (7.5YR 5/4) and pinkish gray (7.5YR 6/2) silty clay, pink (7.5YR 7/4) and pinkish white (7.5YR 8/2) dry; massive; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; few fine distinct mottles; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Clay content: 8 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 2.1 percent

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: 8 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Reaction: pH 5.6 to 6.5

2E horizon

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Clay content: 27 to 35 percent

Reaction: pH 5.1 to 6.5

2Bt/E horizon

Hue: 7.5YR or 10YR

Value: B part: 6 or 7 dry, 4 or 5 moist; E part: 6 or 7 dry, 5 or 6 moist

Chroma: E part: 2 or 3

Clay content: 40 to 50 percent
Reaction: pH 5.1 to 6.5

2Bt horizon

Hue: 10YR, 7.5YR, or 5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Clay content: 40 to 60 percent
Reaction: pH 5.1 to 6.5

2C horizon

Hue: 10YR, 7.5YR, or 5YR
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Clay content: 40 to 60 percent
Reaction: pH 5.1 to 7.3

78B—Fernline silt loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 2,200 to 2,700 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Fernline and similar soils: 90 percent

Minor Components

Noxlin silt loam: 0 to 4 percent
Slopes greater than 4 percent: 0 to 3 percent
Iffgulch and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over glaciolacustrine
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

78D—Fernline silt loam, 4 to 15 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,200 to 2,700 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Fernline and similar soils: 90 percent

Minor Components

Iffgulch and similar soils: 0 to 5 percent
Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over glaciolacustrine
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

781D—Fernline-Cabinet silt loams, 4 to 15 percent slopes

Setting

Landform:
• Fernline—Lake plains or terraces
• Cabinet—Lake plains or terraces
Position on landform:
• Fernline—Treads
• Cabinet—Treads
Slope:
• Fernline—4 to 15 percent
• Cabinet—4 to 15 percent

Elevation: 2,200 to 2,700 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Fernline and similar soils: 50 percent

Cabinet and similar soils: 40 percent

Minor Components

Iffgulch and similar soils: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

Cabinet

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Water table: Perched

Available water capacity: Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

781E—Fernline-Cabinet silt loams, 15 to 30 percent slopes

Setting

Landform:

- Fernline—Lake plains or terraces

- Cabinet—Lake plains or terraces

Position on landform:

- Fernline—Dissected or incised treads

- Cabinet—Dissected or incised treads

Slope:

- Fernline—15 to 30 percent

- Cabinet—15 to 30 percent

Elevation: 2,200 to 2,700 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Fernline and similar soils: 50 percent

Cabinet and similar soils: 40 percent

Minor Components

Iffgulch and similar soils: 0 to 5 percent

Noxlin silt loam: 0 to 3 percent

Slopes greater than 30 percent: 0 to 2 percent

Major Component Description

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

Cabinet

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Water table: Perched

Available water capacity: Mainly 10.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Finleypoint Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Hills

Parent material: Colluvium

Slope range: 15 to 60 percent

Elevation: 3,000 to 4,900 feet

Annual precipitation: 18 to 21 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Finleypoint gravelly loam, 15 to 30 percent slopes, in an area of forestland, 200 feet south and 2,000 feet east of the northwest corner of sec. 13, T. 18 N., R. 21 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A1—0 to 8 inches; very dark gray (10YR 3/1) gravelly loam, black (10YR 2/1) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; 10 percent cobbles and 15 percent pebbles; slightly acid; clear wavy boundary.

A2—8 to 16 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; 25 percent cobbles and 20 percent pebbles; slightly acid; clear wavy boundary.

E—16 to 38 inches; white (10YR 8/2) very cobbly sandy loam, light brownish gray (10YR 6/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine and medium roots; 20 percent cobbles and 30 percent pebbles; slightly acid; gradual wavy boundary.

E/Bw—38 to 60 inches; E part (70 percent) is light gray (10YR 7/1) very cobbly sandy loam, gray (10YR 6/1) moist; B part (30 percent) is light brownish gray (10YR 6/2) very cobbly sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; 25 percent cobbles and 30 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches

Note: Some pedons have a Bw/E horizon in place of the E/Bw horizon.

A1 horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 6.1 to 7.3

A2 horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 20 to 60 percent—0 to 5 percent stones; 10 to 25 percent cobbles; 10 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

E horizon

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 1, 2, or 3

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 15 to 25 percent cobbles; 20 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Loam or sandy loam

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 15 to 25 percent cobbles; 20 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

54E—Finleypoint gravelly loam, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 3,000 to 4,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Finleypoint and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 4 percent
 Areas of rock outcrop: 0 to 3 percent
 Bigarm gravelly loam: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

54F—Finleypoint gravelly loam, 30 to 60 percent slopes**Setting**

Landform: Hills
Slope: 30 to 60 percent
Elevation: 3,000 to 4,800 feet
Mean annual precipitation: 18 to 20 inches
Frost-free period: 90 to 105 days

Composition**Major Components**

Finleypoint and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Bigarm gravelly loam: 0 to 5 percent
 Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

64E—Finleypoint gravelly loam, moist, 15 to 30 percent slopes**Setting**

Landform: Hills
Slope: 15 to 30 percent
Elevation: 3,200 to 4,900 feet
Mean annual precipitation: 19 to 21 inches
Frost-free period: 90 to 100 days

Composition**Major Components**

Finleypoint and similar soils: 85 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent
 Bigarm gravelly loam: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

64F—Finleypoint gravelly loam, moist, 30 to 60 percent slopes**Setting**

Landform: Hills
Slope: 30 to 60 percent
Elevation: 3,200 to 4,900 feet
Mean annual precipitation: 19 to 21 inches
Frost-free period: 90 to 100 days

Composition

Major Components

Finleypoint and similar soils: 85 percent

Minor Components

Bigarm gravelly loam: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

254F—Finleypoint-Rubble land complex, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 3,000 to 4,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Finleypoint and similar soils: 55 percent

Rubble land: 30 percent

Minor Components

Hogsby cobbly loam: 0 to 5 percent

Bigarm gravelly loam: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Finleypoint

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Firetower Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Low stream terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 3,300 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Cumulic Hapludolls

Typical Pedon

Firetower silt loam, in an area of Meadowpeak-Firetower silt loams, 0 to 2 percent slopes, in an area of rangeland, 2,300 feet south and 2,100 feet east of the northwest corner of sec. 23, T. 27 N., R. 28 W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; moderately acid; clear wavy boundary.

Bw1—6 to 17 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; slightly acid; gradual wavy boundary.

Bw2—17 to 29 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very

fine, fine, and medium roots; slightly acid; gradual wavy boundary.

Bw3—29 to 42 inches; grayish brown (10YR 5/2) loam, light brownish gray (10YR 6/2) dry; few fine faint redox concentrations in root channels; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; slightly acid; gradual wavy boundary.

C1—42 to 51 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (2.5Y 6/2) dry; common fine distinct brownish yellow (10YR 6/6) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; common medium roots; neutral; gradual wavy boundary.

C2—51 to 60 inches; grayish brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry; common fine distinct brownish yellow (10YR 6/6) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the mollic epipedon: 16 to 26 inches

Depth to the seasonal high water table: 24 to 42 inches

A horizon

Value: 4 or 5 dry

Clay content: 5 to 18 percent

Reaction: pH 5.6 to 7.3

Bw1 horizon

Value: 4 or 5 dry

Clay content: 5 to 18 percent

Reaction: pH 5.6 to 7.3

Bw2 and Bw3 horizon

Value: 5 or 6 dry; 4 or 5 moist

Texture: Silt loam or loam

Clay content: 5 to 18 percent

Reaction: pH 5.6 to 7.3

C horizons

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 5 to 18 percent

Reaction: pH 6.1 to 7.3

Flott Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Hills

Parent material: Colluvium and glacial drift

Slope range: 15 to 50 percent

Elevation: 2,900 to 4,400 feet

Annual precipitation: 18 to 21 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Flott gravelly loam, 30 to 50 percent slopes, in an area of forestland, 250 feet north of the southeast corner of sec. 36, T. 17 N., R. 21 W.

Oi—3 inches to 0; partially decomposed forest litter.

A1—0 to 10 inches; very dark gray (10YR 3/1) gravelly loam, black (10YR 2/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine and few fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; neutral; clear wavy boundary.

A2—10 to 16 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine and few fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; neutral; abrupt wavy boundary.

Bk—16 to 29 inches; light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; few fine, medium, and coarse roots; 10 percent cobbles and 35 percent pebbles; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Ck—29 to 60 inches; light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; few medium and coarse roots; 15 percent cobbles and 40 percent pebbles; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches

Depth to the Bk horizon: 15 to 30 inches

A horizons

Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 1 or 2
 Clay content: 10 to 27 percent
 Content of rock fragments: 15 to 35 percent—0 to 5 percent stones and cobbles; 15 to 30 percent pebbles
 Reaction: pH 6.1 to 7.3

Bk and Ck horizons

Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Clay content: 18 to 25 percent
 Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and cobbles; 35 to 45 percent pebbles
 Calcium carbonate equivalent: 15 to 25 percent
 Reaction: pH 7.9 to 8.4

61F—Flott gravelly loam, 30 to 50 percent slopes**Setting**

Landform: Hills
Slope: 30 to 50 percent
Elevation: 3,000 to 4,400 feet
Mean annual precipitation: 19 to 21 inches
Frost-free period: 90 to 100 days

Composition**Major Components**

Flott and similar soils: 85 percent

Minor Components

Slopes greater than 50 percent: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent
 Finleypoint gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

62F—Flott gravelly loam, dry, 30 to 50 percent slopes**Setting**

Landform: Hills
Slope: 30 to 50 percent
Elevation: 2,900 to 4,200 feet
Mean annual precipitation: 18 to 20 inches
Frost-free period: 90 to 105 days

Composition**Major Components**

Flott and similar soils: 85 percent

Minor Components

Bigarm gravelly loam: 0 to 5 percent
 Areas of rock outcrop: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Gardencreek Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation: 2,500 to 2,800 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 120 days

Taxonomic Class: Fine, mixed, superactive, nonacid, frigid Aquic Xerofluvents

Typical Pedon

Gardencreek silty clay loam, 0 to 2 percent slopes, in an area of cropland, 1,050 feet north and 900 feet east of the southwest corner of sec. 10, T. 21 N., R. 23 W.

Ap—0 to 8 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, firm, moderately sticky, slightly plastic; many fine and medium and few coarse roots; few very fine and fine tubular and interstitial pores; neutral; clear smooth boundary.

C1—8 to 21 inches; gray (5Y 6/1) silty clay loam, dark gray (5Y 4/1) moist; massive; hard, firm, moderately sticky, moderately plastic; many fine and medium and few coarse roots; many very fine and fine tubular pores; slightly alkaline; abrupt smooth boundary.

C2—21 to 24 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; many fine and few medium tubular pores; slightly alkaline; abrupt smooth boundary.

C3—24 to 43 inches; light gray (5Y 7/1) silty clay, gray (5Y 5/1) moist; massive; very hard, very firm, very sticky, very plastic; few fine and medium roots; many very fine and fine and few medium tubular pores; slightly alkaline; clear smooth boundary.

C4—43 to 60 inches; light gray (5Y 7/1) silty clay, gray (5Y 5/1) moist; common fine faint olive (5Y 5/4) redox concentrations; few very fine and fine tubular pores; massive; hard, firm, very sticky, moderately plastic; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: 42 to 60 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 1 or 2

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 0 to 1 percent

Sodium adsorption ratio: 1 to 5

Reaction: pH 6.6 to 7.8

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 moist; 5, 6, or 7 dry

Chroma: 0 or 1

Clay content: 30 to 40 percent

Calcium carbonate equivalent: 0 to 1 percent

Sodium adsorption ratio: 1 to 5

Reaction: pH 6.6 to 7.8

C2 horizon

Hue: 2.5Y or 5Y

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Chroma: 1 or 2

Clay content: 30 to 40 percent

Calcium carbonate equivalent: 0 to 1 percent

Sodium adsorption ratio: 1 to 5

Reaction: pH 6.6 to 7.8

C3 horizon

Value: 4, 5, or 6 moist; 6, 7, or 8 dry

Chroma: 0 or 1

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Calcium carbonate equivalent: 0 to 1 percent

Sodium adsorption ratio: 5 to 10

Reaction: pH 7.4 to 8.4

C4 horizon

Value: 4, 5, or 6 moist; 6, 7, or 8 dry

Chroma: 1 or 2

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Calcium carbonate equivalent: 0 to 1 percent

Sodium adsorption ratio: 5 to 10

Reaction: pH 7.4 to 8.4

95A—Gardencreek silty clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,500 to 2,800 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components

Gardencreek and similar soils: 90 percent

Minor Components

Sonyok silty clay loam: 0 to 5 percent
 Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Gird Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation: 2,400 to 3,200 feet
Annual precipitation: 15 to 19 inches
Annual air temperature: 40 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-silty, mixed, superactive, frigid Calcic Haploxerolls

Typical Pedon

Gird silt loam, 0 to 4 percent slopes, in an area of cropland, 1,790 feet north and 600 feet west of the southeast corner of sec. 18, T. 19 N., R. 25 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak

fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; neutral; abrupt smooth boundary.

Bw—9 to 16 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; neutral; clear smooth boundary.

Bk—16 to 46 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; disseminated lime; few fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—46 to 60 inches; light yellowish brown (10YR 6/4) very fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Thickness of the mollic epipedon: 12 to 17 inches
Depth to the Bk horizon: 12 to 21 inches

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 10 to 18 percent
 Reaction: pH 6.6 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 or 4 moist
 Clay content: 10 to 18 percent
 Reaction: pH 6.6 to 7.8

Bk horizon

Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 10 to 18 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

C horizon

Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Silt loam or very fine sandy loam
 Clay content: 10 to 18 percent
 Calcium carbonate equivalent: 3 to 10 percent
 Reaction: pH 7.4 to 8.4

3A—Gird silt loam, 0 to 4 percent slopes**Setting***Landform:* Stream terraces*Position on landform:* Treads*Slope:* 0 to 4 percent*Elevation:* 2,400 to 3,200 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Gird and similar soils: 85 percent

Minor Components

McCollum fine sandy loam: 0 to 8 percent

Grantsdale silt loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 2 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

3B—Gird silt loam, 4 to 8 percent slopes**Setting***Landform:* Stream terraces*Position on landform:* Treads*Slope:* 4 to 8 percent*Elevation:* 2,400 to 3,200 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Gird and similar soils: 85 percent

Minor Components

Grantsdale silt loam: 0 to 5 percent

McCollum fine sandy loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**103B—Gird-McCollum complex,
0 to 4 percent slopes****Setting***Landform:*

• Gird—Stream terraces

• McCollum—Stream terraces

Position on landform:

• Gird—Treads

• McCollum—Treads

Slope:

• Gird—0 to 4 percent

• McCollum—0 to 4 percent

Elevation: 2,400 to 3,000 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Gird and similar soils: 50 percent

McCollum and similar soils: 40 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Grantsdale silt loam: 0 to 4 percent

Sacheen loamy fine sand: 0 to 1 percent

Major Component Description

Gird

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.4 inches

McCollum

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

261C—Gird-McCollum complex, 4 to 8 percent slopes

Setting

Landform:

- Gird—Stream terraces
- McCollum—Stream terraces

Position on landform:

- Gird—Treads
- McCollum—Treads

Slope:

- Gird—4 to 8 percent
- McCollum—4 to 8 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 16 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Gird and similar soils: 45 percent
 McCollum and similar soils: 40 percent

Minor Components

Grantsdale silt loam: 0 to 7 percent
 Slopes greater than 8 percent: 0 to 5 percent
 Sacheen loamy fine sand: 0 to 3 percent

Major Component Description

Gird

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.4 inches

McCollum

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Glaciercreek Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderate to 20 inches; very rapid below this depth

Landform: Alluvial fans, stream terraces, and outwash plains

Parent material: Volcanic ash over alluvium and glacial outwash

Slope range: 0 to 45 percent

Elevation range: 2,200 to 4,200 feet

Annual precipitation: 20 to 30 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Andic Eutrudepts

Typical Pedon

Glaciercreek gravelly silt loam, 2 to 8 percent slopes, in an area of forestland, 2,200 feet north and 2,100 feet west of the southeast corner of sec. 11, T. 26 N., R. 27 W.

Oi—1 to 0 inch; partially decomposed forest litter.

A—0 to 2 inches; brown (10YR 4/3) gravelly silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 15 percent pebbles; slightly acid; clear wavy boundary.

Bw—2 to 9 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 15 percent pebbles; moderately acid; clear wavy boundary.

2E/Bw—9 to 20 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 45 percent pebbles; moderately acid; gradual wavy boundary.

2C1—20 to 32 inches; very pale brown (10YR 7/3) extremely gravelly loamy sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky, nonplastic; common fine, medium, and coarse roots; 15 percent cobbles and 60 percent pebbles; moderately acid; gradual wavy boundary.

2C2—32 to 60 inches; very pale brown (10YR 7/3) extremely cobbly loamy sand, pale brown (10YR 6/3) moist; single grain; loose, nonsticky, nonplastic; common fine, medium, and coarse roots; 35 percent cobbles and 45 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Moist bulk density: Less than 0.95 g/cm³

Reaction: pH 5.6 to 7.3

Bw horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Moist bulk density: Less than 0.95 g/cm³

Reaction: pH 5.6 to 7.3

2E/Bw horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 30 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

2C horizons

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Clay content: 0 to 10 percent

Content of rock fragments: 60 to 90 percent—0 to 5 percent stones; 15 to 35 percent cobbles; 45 to 60 percent pebbles

Reaction: pH 5.6 to 7.3

67A—Glaciercreek gravelly silt loam, cool, 0 to 2 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Treads

Slope: 0 to 2 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Loonlake gravelly silt loam: 0 to 5 percent

Slopes greater than 2 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

67C—Glaciercreek gravelly silt loam, cool, 2 to 8 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Loonlake gravelly silt loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

671C—Glaciercreek gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Terraces and alluvial fans

Slope: 2 to 8 percent

Elevation: 2,200 to 2,800 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Dewberry silt loam: 0 to 6 percent

Oldtrail gravelly sandy loam: 0 to 2 percent

Slopes greater than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

671E—Glaciercreek gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Terraces and alluvial fans

Slope: 8 to 30 percent

Elevation: 2,200 to 2,800 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Dewberry gravelly silt loam: 0 to 4 percent

Oldtrail gravelly sandy loam: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

867E—Glaciercreek gravelly silt loam, cool, 8 to 30 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Risers

Slope: 8 to 30 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Loonlake gravelly silt loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

867F—Glaciercreek gravelly silt loam, cool, 30 to 45 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Risers

Slope: 30 to 45 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Glaciercreek and similar soils: 90 percent

Minor Components

Tamarack loam: 0 to 5 percent

Slopes greater than 45 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Grantsdale Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate to the 2C horizon; rapid below this depth

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation: 2,400 to 3,000 feet

Annual air temperature: 43 to 45 degrees F

Annual precipitation: 11 to 17 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-silty over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Haploxerolls

Typical Pedon

Grantsdale silt loam, 0 to 4 percent slopes, in an area of pasture, 1,700 feet north and 1,500 feet west of the southeast corner of sec. 27, T. 18 N., R. 21 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; neutral; abrupt smooth boundary.

Bw—7 to 14 inches; grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium and coarse roots; neutral; clear smooth boundary.

Bk1—14 to 21 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine irregular masses of lime; violently effervescent; neutral; gradual smooth boundary.

Bk2—21 to 27 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; few fine irregular masses of lime; strongly effervescent; slightly alkaline; clear smooth boundary.

2C—27 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few fine roots; 15 percent cobbles and 50 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 45 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the mollic epipedon: 7 to 14 inches

Depth to the Bk horizon: 14 to 20 inches

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam, very fine sandy loam, or silt loam

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

Bk horizons

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, very fine sandy loam, or silt loam

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2C horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 70 percent—5 to 20 percent cobbles; 30 to 50 percent pebbles

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.4 to 8.4

1A—Grantsdale silt loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,400 to 3,000 feet

Mean annual precipitation: 11 to 17 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Grantsdale and similar soils: 85 percent

Minor Components

Gird silt loam: 0 to 5 percent

McCollum fine sandy loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 3 percent

Lamoose and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Half Moon Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 2 to 60 percent

Elevation: 2,500 to 3,500 feet

Annual precipitation: 20 to 34 inches

Annual air temperature: 40 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Fine-silty, mixed, active, frigid
Typic Haplustalfs

Typical Pedon

Half Moon silt loam, 2 to 8 percent slopes, in an area of forestland, 2,100 feet south and 1,050 feet east of the northwest corner of sec. 8, T. 19 N., R. 26 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 4 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common fine and medium and few coarse roots; neutral; clear smooth boundary.

E/Bt—4 to 14 inches; E part (70 percent) is pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; B part (30 percent) is light yellowish brown (10YR 6/4) silt loam, dark yellowish brown (10YR 4/4) moist; strong medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium roots; few faint clay films on faces of peds; neutral; clear smooth boundary.

Bt—14 to 26 inches; light yellowish brown (10YR 6/4) silty clay loam, dark yellowish brown (10YR 4/4) moist; strong medium angular blocky structure;

hard, firm, moderately sticky, moderately plastic; common fine and few medium roots; common faint clay films on faces of peds and lining pores; neutral; clear smooth boundary.

Bk—26 to 35 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; few fine irregular masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—35 to 60 inches; very pale brown (10YR 7/4) stratified very fine sandy loam and silt loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine irregular masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 14 to 35 inches

E horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Content of rock fragments: 0 to 15 percent—0 to 10 percent cobbles; 0 to 5 percent pebbles

Reaction: pH 4.5 to 7.3

E/Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Clay content: 15 to 25 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent pebbles

Reaction: pH 4.5 to 7.3

Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Silt loam or silty clay loam

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.8

Bk horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4
 Texture: Silt loam or silty clay loam
 Clay content: 25 to 30 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity (mmhos/cm): 0 to 4
 Reaction: pH 7.4 to 8.4

C horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: Very fine sandy loam or silt loam with thin lenses of silty clay
 Clay content: 20 to 30 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Electrical conductivity (mmhos/cm): 0 to 4
 Reaction: pH 7.9 to 9.0

70B—Half Moon silt loam, 2 to 8 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 2 to 8 percent
Elevation: 2,500 to 3,200 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Half Moon and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 4 percent
 Selon fine sandy loam: 0 to 4 percent
 Half moon gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

70D—Half Moon silt loam, 8 to 15 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 8 to 15 percent
Elevation: 2,500 to 3,200 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Half Moon and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 4 percent
 Selon fine sandy loam: 0 to 4 percent
 Half moon gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

70E—Half Moon silt loam, 15 to 30 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Dissected or incised treads
Slope: 15 to 30 percent
Elevation: 2,500 to 3,200 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Half Moon and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent
 Selon fine sandy loam: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

291B—Half Moon silt loam, cool, 2 to 8 percent slopes**Setting**

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 2 to 8 percent
Elevation: 3,100 to 3,500 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 80 days

Composition**Major Components**

Half Moon and similar soils: 85 percent

Minor Components

Whitepine silt loam: 0 to 7 percent
 Rumblecreek, dry: 0 to 3 percent
 Slopes greater than 8 percent: 0 to 3 percent
 Auggie silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

291D—Half Moon silt loam, cool, 8 to 15 percent slopes**Setting**

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 8 to 15 percent
Elevation: 3,100 to 3,500 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 80 days

Composition**Major Components**

Half Moon and similar soils: 90 percent

Minor Components

Auggie silt loam: 0 to 3 percent
 Crystalex loamy coarse sand: 0 to 3 percent
 Glaciercreek, cool: 0 to 2 percent
 Slopes greater than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

291E—Half Moon silt loam, cool, 15 to 35 percent slopes**Setting**

Landform: Lake plains or terraces
Position on landform: Risers
Slope: 15 to 35 percent
Elevation: 3,100 to 3,500 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 80 days

Composition

Major Components

Half Moon and similar soils: 90 percent

Minor Components

Auggie silt loam: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

291F—Half Moon silt loam, cool, 35 to 60 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 35 to 60 percent

Elevation: 3,100 to 3,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 80 days

Composition

Major Components

Half Moon and similar soils: 90 percent

Minor Components

Auggie silt loam: 0 to 7 percent

Tamarack loam: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Flooding: None

Available water capacity: Mainly 10.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hewolf Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately rapid to the 2C horizon; rapid below this depth

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,500 to 2,800 feet

Annual precipitation: 14 to 16 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
Fluventic Haploxerolls

Typical Pedon

Hewolf gravelly loam, 0 to 2 percent slopes, in an area of irrigated pasture, 700 feet south and 1,500 feet east of the northwest corner of sec. 27, T. 18 N., R. 21 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium roots; 20 percent pebbles; neutral; clear smooth boundary.

Bw—7 to 13 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium roots; 40 percent pebbles; neutral; clear wavy boundary.

2C—13 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; 5 percent cobbles and 60 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 12 and 35 inches

Thickness of the mollic epipedon: 7 to 11 inches

Depth to the seasonal high water table: 60 to 72 inches

Notes: Where uncultivated, the Ap horizon contains an irregular decrease in organic carbon. The Bw horizon may not be present in all pedons.

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 8 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sandy loam or fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

2C horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Sand or loamy sand

Clay content: 0 to 5 percent

Content of rock fragments: 45 to 75 percent—0 to 10 percent cobbles; 45 to 65 percent pebbles

Reaction: pH 6.6 to 7.3

8A—Hewolf gravelly loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 2 percent

Elevation: 2,500 to 2,800 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Hewolf and similar soils: 90 percent

Minor Components

Grantsdale silt loam: 0 to 7 percent

Lamoose and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hogheaven Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,700 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 43 degrees F

Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-silty, mixed, superactive, frigid Aquic Haploxerolls

Typical Pedon

Hogheaven silt loam, 0 to 2 percent slopes, in an area of pasture, 2,800 feet south and 1,250 feet west of the northeast corner of sec. 13, T. 24 N., R. 23 W.

Apn1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Apn2—2 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common

fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bkn1—8 to 15 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine roots; common very fine and fine pores; disseminated lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bkn2—15 to 21 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; few fine pores; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

C1—21 to 42 inches; white (10YR 8/2) silt loam, brown (10YR 5/3) moist; few faint yellowish brown (10YR 5/8) redox concentrations; massive; soft, very friable, nonsticky, nonplastic; few fine and very fine roots; moderately alkaline; gradual smooth boundary.

C2—42 to 60 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; common faint yellowish brown (10YR 5/8) redox concentrations; massive; soft, very friable, nonsticky, nonplastic; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Bkn horizon: 5 to 12 inches

Depth to the seasonal high water table: 24 to 42 inches

Note: In the Apn horizons, a thin surface layer may have a sodium adsorption ratio from 10 to 13.

Apn horizons

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 10 to 18 percent

Calcium carbonate equivalent: 3 to 10 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

Bkn horizons

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Chroma: 2, 3, or 4

Texture: Silt loam or silt

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 3 to 15 percent

Electrical conductivity (mmhos/cm): 0 to 3

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.9 to 9.0

C horizons

Value: 4, 5, or 6 moist; 6, 7, or 8 dry

Chroma: 2, 3, or 4

Texture: Silt loam, very fine sandy loam, or silt

Clay content: 5 to 18 percent

Electrical conductivity (mmhos/cm): 0 to 1

Sodium adsorption ratio: 5 to 13

Reaction: pH 7.9 to 8.4

85A—Hogheaven silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 120 days

Composition

Major Components

Hogheaven and similar soils: 85 percent

Minor Components

Sonyok silty clay loam: 0 to 8 percent

Marklepass silty clay loam: 0 to 4 percent

Slopes greater than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Hogsby Series*Depth class:* Shallow*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Hills*Parent material:* Residuum and colluvium derived from argillite and quartzite*Slope range:* 8 to 60 percent*Elevation:* 2,600 to 5,200 feet*Annual precipitation:* 15 to 20 inches*Annual air temperature:* 39 to 45 degrees F*Frost-free period:* 90 to 120 days**Taxonomic Class:** Loamy-skeletal, mixed, superactive, frigid Lithic Haploxerolls**Typical Pedon**

Hogsby cobbly loam, in an area of Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes, in an area of rangeland, 350 feet south and 2,750 feet east of the northwest corner of sec. 10, T. 19 N., R. 22 W.

A—0 to 9 inches; grayish brown (10YR 5/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure parting to moderate medium subangular blocky; soft, very friable, slightly sticky, nonplastic; common very fine and medium roots; 25 percent cobbles and 5 percent pebbles; neutral; clear smooth boundary.

Bw—9 to 12 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common fine and few medium roots; 25 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.

C—12 to 17 inches; pale brown (10YR 6/3) extremely channery loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; 30 percent pebbles and 40 percent channers; neutral; clear smooth boundary.

R—17 inches; argillite bedrock.

Range in Characteristics*Soil temperature:* 41 to 47 degrees F*Moisture control section:* Between 8 and 24 inches*Thickness of the mollic epipedon:* 7 to 12 inches*Depth to bedrock:* 10 to 20 inches**A horizon**

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 15 to 35 percent—
15 to 25 percent cobbles; 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 35 to 70 percent—
20 to 35 percent cobbles; 15 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

C horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 60 to 75 percent—
30 to 40 percent cobbles; 30 to 35 percent pebbles or channers

Reaction: pH 6.6 to 7.3

53F—Hogsby-Rubble land-Rock outcrop complex, 15 to 60 percent slopes**Setting***Landform:* Hills*Slope:* 15 to 60 percent*Elevation:* 2,600 to 4,800 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 90 to 120 days**Composition****Major Components**

Hogsby and similar soils: 35 percent

Rubble land: 25 percent

Rock outcrop: 25 percent

Minor Components

Bigarm gravelly loam: 0 to 5 percent

Finleypoint gravelly loam: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Major Component Description**Hogsby***Surface layer texture:* Cobbly loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium or residuum*Native plant cover type:* Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

153F—Hogsby-Finleypoint-Rock outcrop complex, 30 to 60 percent slopes

Setting

Landform:

- Hogsby—Hills
- Finleypoint—Hills

Slope:

- Hogsby—30 to 60 percent
- Finleypoint—30 to 60 percent

Elevation: 3,000 to 4,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Hogsby and similar soils: 35 percent

Finleypoint and similar soils: 35 percent

Rock outcrop: 15 percent

Minor Components

Areas of rubble land: 0 to 7 percent

Bigarm gravelly loam: 0 to 5 percent

Slopes greater than 60 percent: 0 to 3 percent

Major Component Description

Hogsby

Surface layer texture: Cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Finleypoint

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Holloway Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Volcanic ash over colluvium derived from argillite or quartzite

Slope range: 8 to 70 percent

Elevation: 3,800 to 7,000

Annual precipitation: 28 to 50 inches

Annual air temperature: 35 to 42 degrees F

Frost-free period: 30 to 60 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Eutrocryepts

Typical Pedon

Holloway gravelly silt loam, 35 to 60 percent slopes, in an area of forestland, 2,000 feet north and 600 feet east of the southwest corner of sec. 18, T. 21 N., R. 24 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 9 inches; brownish yellow (10YR 6/6) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 15 percent pebbles; slightly acid; clear smooth boundary.

2E—9 to 21 inches; light gray (10YR 7/2) very gravelly fine sandy loam, grayish brown (10YR

5/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 5 percent cobbles and 45 percent pebbles; slightly acid; gradual wavy boundary.

2E/Bw—21 to 41 inches; E part (80 percent) is light brownish gray (10YR 6/2) extremely gravelly fine sandy loam, grayish brown (10YR 5/2) moist; B part (20 percent) is brown (10YR 5/3) extremely gravelly loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; 10 percent cobbles and 55 percent pebbles; slightly acid; gradual wavy boundary.

2C—41 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; 5 percent cobbles and 65 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 14 inches

A horizon

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 4 or 6

Clay content: 5 to 15 percent

Content of rock fragments: 10 to 35 percent—0 to 10 percent stones and cobbles; 10 to 25 percent pebbles

Moist bulk density: 1.0 g/cm³ or less

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Reaction: pH 5.1 to 6.5

2E horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 45 to 75 percent—0 to 15 percent stones and cobbles; 45 to 60 percent pebbles

Reaction: pH 5.1 to 6.5

2E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture, mixed: Sandy loam or fine sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 80 percent—5 to 15 percent stones and cobbles; 55 to 65 percent pebbles

Reaction: pH 5.1 to 6.5

2C horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 85 percent—5 to 20 percent stones and cobbles; 55 to 65 percent pebbles

Reaction: pH 5.1 to 6.5

40E—Holloway gravelly silt loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,800 to 6,500 feet

Mean annual precipitation: 36 to 45 inches

Frost-free period: 40 to 60 days

Composition

Major Components

Holloway and similar soils: 85 percent

Minor Components

Waldbillig gravelly silt loam: 0 to 4 percent

Slopes greater than 35 percent: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Holloway, cool: 0 to 4 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

40F—Holloway gravelly silt loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 36 to 45 inches
Frost-free period: 40 to 60 days

Composition

Major Components

Holloway and similar soils: 85 percent

Minor Components

Holloway, cool: 0 to 4 percent
 Waldbillig gravelly silt loam: 0 to 4 percent
 Slopes greater than 60 percent: 0 to 4 percent
 Areas of rubble land: 0 to 2 percent
 Areas of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

40G—Holloway-Rubble land complex, 40 to 70 percent slopes

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 36 to 45 inches
Frost-free period: 40 to 50 days

Composition

Major Components

Holloway and similar soils: 60 percent
 Rubble land: 25 percent

Minor Components

Holloway, bouldery: 0 to 5 percent
 Mitten gravelly silt loam: 0 to 4 percent
 Slopes greater than 70 percent: 0 to 3 percent
 Holloway, cool: 0 to 3 percent

Major Component Description

Holloway

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

42E—Holloway gravelly silt loam, cool, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 40 to 50 inches
Frost-free period: 30 to 50 days

Composition

Major Components

Holloway and similar soils: 85 percent

Minor Components

Phillcher gravelly silt loam: 0 to 5 percent
 Slopes greater than 35 percent: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

42F—Holloway gravelly silt loam, cool, 35 to 60 percent slopes**Setting**

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 40 to 50 inches
Frost-free period: 30 to 50 days

Composition**Major Components**

Holloway and similar soils: 85 percent

Minor Components

Phillcher gravelly silt loam: 0 to 5 percent
 Areas of rubble land: 0 to 4 percent
 Slopes greater than 60 percent: 0 to 4 percent
 Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

42G—Holloway, cool-Rock outcrop complex, 40 to 70 percent slopes**Setting**

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 40 to 50 inches
Frost-free period: 30 to 50 days

Composition**Major Components**

Holloway and similar soils: 60 percent
 Rock outcrop: 25 percent

Minor Components

Phillcher gravelly silt loam: 0 to 5 percent
 Slopes greater than 70 percent: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent

Major Component Description**Holloway**

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

143F—Holloway-Waldbillig gravelly silt loams, 30 to 50 percent slopes

Setting

Landform:

- Holloway—Mountains
- Waldbillig—Mountains

Slope:

- Holloway—30 to 50 percent
- Waldbillig—30 to 50 percent

Elevation: 4,800 to 6,500 feet

Mean annual precipitation: 36 to 45 inches

Frost-free period: 40 to 50 days

Composition

Major Components

Holloway and similar soils: 50 percent

Waldbillig and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Slopes greater than 50 percent: 0 to 5 percent

Waldbillig, stony: 0 to 3 percent

Waldbillig, bouldery: 0 to 2 percent

Major Component Description

Holloway

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.3 inches

Waldbillig

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

144F—Holloway-Waldbillig gravelly silt loams, cool, 30 to 50 percent slopes

Setting

Landform:

- Holloway—Mountains
- Waldbillig—Mountains

Slope:

- Holloway—30 to 50 percent
- Waldbillig—30 to 50 percent

Elevation: 5,500 to 7,000 feet

Mean annual precipitation: 40 to 50 inches

Frost-free period: 30 to 50 days

Composition

Major Components

Holloway and similar soils: 50 percent

Waldbillig and similar soils: 35 percent

Minor Components

Phillcher gravelly silt loam: 0 to 5 percent

Slopes greater than 50 percent: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Areas of rubble land: 0 to 3 percent

Major Component Description

Holloway

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.4 inches

Waldbillig

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**322E—Holloway gravelly silt loam, moist,
15 to 35 percent slopes****Setting***Landform:* Mountains*Slope:* 15 to 35 percent*Elevation:* 3,800 to 5,600 feet*Mean annual precipitation:* 28 to 38 inches*Frost-free period:* 40 to 60 days**Composition****Major Components**

Holloway and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Felan gravelly silt loam: 0 to 3 percent

Areas of rock outcrop: 0 to 1 percent

Holloway moist, seeped: 0 to 1 percent

Major Component Description*Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Volcanic ash over colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**322F—Holloway gravelly silt loam, moist,
35 to 60 percent slopes****Setting***Landform:* Mountains*Slope:* 35 to 60 percent*Elevation:* 3,800 to 6,400 feet*Mean annual precipitation:* 28 to 38 inches*Frost-free period:* 40 to 60 days**Composition****Major Components**

Holloway and similar soils: 90 percent

Minor Components

Bata gravelly silt loam: 0 to 3 percent

Rumblecreek gravelly loam: 0 to 3 percent

Felan gravelly silt loam: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description*Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Volcanic ash over colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**323G—Holloway, moist-Rock outcrop
complex, 40 to 70 percent slopes****Setting***Landform:* Mountains*Slope:* 40 to 70 percent*Elevation:* 4,800 to 6,400 feet*Mean annual precipitation:* 34 to 48 inches*Frost-free period:* 30 to 50 days**Composition****Major Components**

Holloway and similar soils: 70 percent

Rock outcrop: 20 percent

Minor Components

Felan gravelly silt loam: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Major Component Description**Holloway***Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Volcanic ash over colluvium*Native plant cover type:* Forestland

Flooding: None

Available water capacity: Mainly 3.3 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Horseplains Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 120 days

Taxonomic Class: Sandy, mixed, frigid Typic Xerofluvents

Typical Pedon

Horseplains fine sandy loam, 0 to 2 percent slopes, in an area of forestland, 1,400 feet north and 500 feet east of the southwest corner of sec. 16, T. 20 N., R. 26 W.

A—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and medium and common coarse roots; neutral; clear smooth boundary.

C1—4 to 10 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; many fine, common medium and few coarse roots; neutral; clear wavy boundary.

C2—10 to 35 inches; pale brown (10YR 6/3) stratified loamy fine sand and fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; many fine, common medium, and few coarse roots; neutral; clear smooth boundary.

C3—35 to 39 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR

3/2) moist; massive; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; slightly alkaline; clear smooth boundary.

C4—39 to 60 inches; pale brown (10YR 6/3) stratified loamy fine sand and fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; common fine and medium and few coarse roots; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

C1 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

C2 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand or fine sand

Clay content: 0 to 10 percent

Reaction: pH 6.6 to 7.3

C3 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Very fine sandy loam or fine sandy loam

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.8

C4 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand or fine sand

Clay content: 0 to 10 percent

Reaction: pH 6.6 to 7.8

51A—Horseplains-Riverwash complex, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Composition

Major Components

Horseplains and similar soils: 55 percent

Riverwash: 35 percent

Minor Components

Slopes greater than 2 percent: 0 to 4 percent

Horseplains, channeled: 0 to 4 percent

Lamoose and similar soils: 0 to 2 percent

Major Component Description

Horseplains

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Available water capacity: Mainly 4.9 inches

Riverwash

Definition: Unstable, flooded areas of sandy or gravelly sediments that support little or no vegetation.

Flooding: Frequent

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

93A—Horseplains fine sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Composition

Major Components

Horseplains and similar soils: 90 percent

Minor Components

Slopes greater than 2 percent: 0 to 5 percent

Horseplains, channeled: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Rare

Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

251A—Horseplains fine sandy loam, gravelly substratum, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Composition

Major Components

Horseplains and similar soils: 85 percent

Minor Components

Areas of riverwash: 0 to 5 percent

Horseplains, channeled: 0 to 5 percent

Slopes greater than 2 percent: 0 to 4 percent

Lamoose and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Available water capacity: Mainly 4.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Ibex Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate above the 2C horizon;
rapid in the 2C horizon

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,200 to 2,600 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, acid, frigid
Typic Endoaquepts

Typical Pedon

Ibex silt loam, 0 to 2 percent slopes, in an area of forestland, 200 feet south and 600 feet west of the northeast corner of sec. 16, T. 28 N., R. 33 W.

A—0 to 1 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; hard, very friable, nonsticky, nonplastic; many very fine and fine roots; strongly acid; abrupt smooth boundary.

E—1 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; hard, very friable, nonsticky, nonplastic; many very fine and common fine roots; strongly acid; abrupt wavy boundary.

Bw1—4 to 9 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak very coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few distinct strong brown (7.5YR 5/6) redox concentrations; strongly acid; clear wavy boundary.

Bw2—9 to 25 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak very coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky, nonplastic; common very fine and fine roots; few distinct strong brown (7.5YR 5/6) redox

concentrations; strongly acid (pH 5.4); gradual wavy boundary.

C1—25 to 29 inches; variegated colors consisting of 80 percent grayish brown (10YR 5/2) and 20 percent gray (10YR 5/1) fine sandy loam, light gray (10YR 7/2 and 7/1) dry; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; common distinct strong brown (7.5YR 4/6) redox concentrations; strongly acid; clear wavy boundary.

2C2—29 to 52 inches; gray (10YR 5/1) extremely gravelly coarse sand, light gray (10YR 7/1) dry; single grain; loose, nonsticky, nonplastic; few very fine roots; 10 percent cobbles and 55 percent pebbles; strongly acid; clear wavy boundary.

2C3—52 to 60 inches; dark brown (7.5YR 4/4) extremely gravelly coarse sand, brown (7.5YR 5/4) dry; single grain; loose, nonsticky, nonplastic; few very fine roots; 10 percent cobbles and 55 percent pebbles; strongly acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Depth to the 2C horizon: 25 to 35 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 2 or 3 moist; 4, 5, or 6 dry

Chroma: 2 or 3

Clay content: 4 to 12 percent; less than 15 percent fine sand or coarser

Reaction: pH 4.5 to 5.5

E horizon

Clay content: 4 to 12 percent; less than 15 percent fine sand or coarser

Reaction: pH 4.5 to 5.5

Bw1 horizon

Clay content: 4 to 12 percent; less than 15 percent fine sand and coarser

Reaction: pH 4.5 to 5.5

Bw2 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 6 or 7 dry

Texture: Silt loam or very fine sandy loam

Clay content: 4 to 12 percent; less than 15 percent fine sand and coarser

Reaction: pH 4.5 to 5.5

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Chroma: 0, 1, or 2

Texture: Fine sandy loam or sandy loam
 Clay content: 0 to 5 percent
 Reaction: pH 4.5 to 5.5

2C2 horizon

Value: 4 or 5 moist; 6 or 7 dry
 Texture: Coarse sand, sand, loamy coarse sand,
 or loamy sand
 Clay content: 0 to 5 percent
 Content of rock fragments: 60 to 80 percent—
 10 to 20 percent cobbles; 50 to 60 percent
 pebbles
 Reaction: pH 4.5 to 5.5

2C3 horizon

Value: 4 or 5 moist; 5 or 6 dry
 Chroma: 4 or 6
 Texture: Coarse sand, sand, loamy coarse sand,
 or loamy sand
 Clay content: 0 to 5 percent
 Content of rock fragments: 60 to 80 percent—
 10 to 20 percent cobbles; 50 to 60 percent
 pebbles
 Reaction: pH 4.5 to 5.5

895A—Ibex silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 2 percent
Elevation: 2,200 to 2,600 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Ibex and similar soils: 90 percent

Minor Components

Oldtrail gravelly sandy loam: 0 to 8 percent
 Bigbeaver, occasionally flooded: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Iffgulch Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Drainageways
Parent material: Alluvium from glaciolacustrine deposits
Slope range: 0 to 4 percent
Elevation range: 2,400 to 2,800 feet
Annual precipitation: 28 to 32 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, mixed, active, frigid Typic Endoaquolls

Typical Pedon

Iffgulch clay, 0 to 4 percent slopes, in an area of forestland, 1,500 feet south and 2,100 feet west of the northeast corner of sec. 36, T. 25 N., R. 32 W.

- A—0 to 2 inches; very dark grayish brown (10YR 3/2) clay, dark grayish brown (10YR 4/2) dry; strong fine and medium granular structure; hard, firm, moderately sticky, moderately plastic; many very fine, fine, and medium roots; moderately acid; clear wavy boundary.
- Bg1—2 to 10 inches; very dark gray (10YR 3/1) clay, gray (10YR 5/1) dry; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm, moderately sticky, moderately plastic; many very fine, fine, and medium roots; slightly acid; clear wavy boundary.
- Bg2—10 to 24 inches; gray (5Y 5/1) silty clay, gray (5Y 6/1) dry; moderate medium prismatic structure parting to strong medium subangular blocky; very hard, very firm, moderately sticky, moderately plastic; common very fine, fine, and medium roots; few fine prominent yellowish brown (10YR 5/6) redox concentrations; neutral; clear wavy boundary.
- Bg3—24 to 33 inches; gray (5Y 6/1) silty clay, light gray (5Y 7/1) dry; moderate medium prismatic structure parting to strong medium subangular

blocky; very hard, very firm, moderately sticky, moderately plastic; common very fine, fine, and medium roots; few fine prominent yellowish brown (10YR 5/6) redox concentrations; neutral; clear wavy boundary.

Cg1—33 to 46 inches; gray (5Y 6/1) clay loam, light gray (5Y 7/1) dry; massive; very hard, very firm, moderately sticky, moderately plastic; few fine and medium roots; common fine and medium prominent yellowish brown (10YR 5/6) redox concentrations and many fine and medium distinct greenish gray (5G 6/1) redox depletions; neutral; gradual wavy boundary.

Cg2—46 to 60 inches; gray (5Y 6/1) gravelly clay loam, light gray (5Y 7/1) dry; massive; very hard, very firm, moderately sticky, moderately plastic; few fine and medium roots; common fine and medium prominent yellowish brown (10YR 5/6) redox concentrations and many fine and medium distinct greenish gray (5G 6/1) redox depletions; 15 percent pebbles and 5 percent cobbles; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 2 or 3 moist; 3, 4, or 5 dry

Clay content: 40 to 60 percent

Reaction: pH 5.6 to 6.5

Bg1 horizon

Value: 2 or 3 moist; 4 or 5 dry

Texture: Silty clay loam

Clay content: 40 to 60 percent

Reaction: pH 5.6 to 6.5

Bg2 and Bg3 horizons

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Clay content: 40 to 60 percent

Reaction: pH 5.6 to 7.3

Cg1 horizon

Hue: 5Y, 5GY, or 5G

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Clay content: 27 to 40 percent

Reaction: pH 5.6 to 7.3

Cg2 horizon

Hue: 5Y, 5GY, or 5G

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Clay content: 27 to 40 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 5.6 to 7.3

89B—Iffgulch clay, 0 to 4 percent slopes

Setting

Landform: Drainageways

Slope: 0 to 4 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Iffgulch and similar soils: 90 percent

Minor Components

Fernline silt loam: 0 to 5 percent

Larchpoint silt loam: 0 to 3 percent

Bigbeaver, occasionally flooded: 0 to 2 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Irvine Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 4 to 60 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, illitic, calcareous, frigid Typic Xerorthents

Typical Pedon

Irvine silty clay loam, in an area of Irvine-Round Butte silty clay loams, 8 to 35 percent slopes, in an area of rangeland, 2,600 feet north and 1,000 feet west of the southeast corner of sec. 13, T. 21 N., R. 22 W.

A—0 to 3 inches; light gray (10YR 7/1) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium platy structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

C1—3 to 7 inches; light gray (10YR 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; slightly effervescent; slightly alkaline; gradual smooth boundary.

C2—7 to 15 inches; very pale brown (10YR 7/3) silty clay, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; few fine and medium roots; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—15 to 60 inches; very pale brown (10YR 8/3) silty clay, pale brown (10YR 6/3) moist; massive; 1/8- to 1/4-inch thick varves; hard, firm, moderately sticky, moderately plastic; few fine roots; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the varved lake sediments: 11 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Clay content: 35 to 40 percent

Electrical conductivity (mmhos/cm): 0 to 2

Reaction: pH 7.4 to 8.4

C1 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

C3 horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 8 to 13

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 9.0

116E—Irvine-Round Butte silty clay loams, 8 to 35 percent slopes

Setting

Landform:

- Irvine—Lake plains or terraces
- Round Butte—Lake plains or terraces

Position on landform:

- Irvine—Dissected or incised treads
- Round Butte—Dissected or incised treads

Slope:

- Irvine—8 to 35 percent
- Round Butte—8 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Irvine and similar soils: 55 percent

Round Butte and similar soils: 30 percent

Minor Components

Lonepine silt loam: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Areas of lake sediment outcrop: 0 to 5 percent

Major Component Description

Irvine

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Round Butte

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

116F—Irvine-Lake sediment outcrop complex, 35 to 60 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Dissected or incised treads
Slope: 35 to 60 percent
Elevation: 2,500 to 3,000 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Irvine and similar soils: 65 percent
 Areas of lake sediment outcrop: 25 percent

Minor Components

Lonepine silt loam: 0 to 5 percent
 Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Irvine

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Lake sediment outcrop

Definition: Areas of varved lacustrine deposits.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Jocko Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Rapid

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation: 2,500 to 3,100 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 100 to 110 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
 Calcic Haploxerolls

Typical Pedon

Jocko gravelly loam, 0 to 4 percent slopes, in an area of rangeland, 20 feet north and 2,600 feet east of the southwest corner of sec. 23, T. 24 N., R. 23 W.

A—0 to 8 inches; grayish brown (10YR 5/2) gravelly loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 10 percent cobbles and 20 percent pebbles; neutral; clear wavy boundary.

Bw—8 to 15 inches; brown (10YR 5/3) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 25 percent cobbles and 25 percent pebbles; neutral; gradual wavy boundary.

Bk—15 to 60 inches; light brownish gray (10YR 6/2) extremely cobbly loamy sand, dark grayish brown

(10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; 30 percent cobbles and 45 percent pebbles; disseminated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 12 and 35 inches

Thickness of the mollic epipedon: 11 to 20 inches

Depth to the Bk horizon: 15 to 30 inches

A horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 25 percent

Content of rock fragments: 15 to 35 percent—0 to 15 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

Bk horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 0 to 5 percent

Content of rock fragments: 60 to 85 percent—15 to 30 percent cobbles; 45 to 55 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 7.8

7B—Jocko gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,500 to 3,100 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Jocko and similar soils: 90 percent

Minor Components

Gardencreek silty clay loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Kerrdam Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains and terraces

Parent material: Eolian deposits

Slope range: 0 to 35 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-silty, mixed, active, frigid Calcic Haploxerepts

Typical Pedon

Kerrdam silt loam, 0 to 4 percent slopes, in an area of rangeland, 1,500 feet south and 1,200 feet east of the northwest corner of sec. 25, T. 23 N., R. 24 W.

A—0 to 3 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine and few medium roots; neutral; clear smooth boundary.

Bw1—3 to 7 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine and few medium roots; neutral; clear smooth boundary.

Bw2—7 to 20 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few very fine and fine roots; slightly effervescent; neutral; gradual smooth boundary.

Bk—20 to 30 inches; white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine roots; few fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—30 to 60 inches; white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 12 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2 or 3

Texture: Silt loam or very fine sandy loam

Clay content: 0 to 5 percent

Calcium carbonate equivalent: 2 to 10 percent

Reaction: pH 7.4 to 8.4

17B—Kerrdam silt loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kerrdam and similar soils: 85 percent

Minor Components

Dryfork silt loam: 0 to 5 percent

Lonepine silt loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

17D—Kerrdam silt loam, 4 to 15 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Dissected or incised treads

Slope: 4 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kerrdam and similar soils: 85 percent

Minor Components

Dryfork silt loam: 0 to 5 percent

Lonepine silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

17E—Kerrdam silt loam, 15 to 35 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Dissected or incised treads

Slope: 15 to 35 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kerrdam and similar soils: 85 percent

Minor Components

Lonepine silt loam: 0 to 5 percent

Sacheen loamy fine sand, dry: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

117E—Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes

Setting

Landform:

- Kerrdam—Lake plains or terraces

- Dryfork—Lake plains or terraces

- Vincom—Lake plains or terraces

Position on landform:

- Kerrdam—Dissected or incised treads

- Dryfork—Dissected or incised treads

- Vincom—Dissected or incised treads

Slope:

- Kerrdam—8 to 20 percent

- Dryfork—8 to 15 percent

- Vincom—12 to 35 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kerrdam and similar soils: 40 percent

Dryfork and similar soils: 25 percent

Vincom and similar soils: 20 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Areas of lake sediment outcrop: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Kerrdam

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.0 inches

Dryfork

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 10.3 inches

Vincom

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

217E—Kerrdam-Round Butte-Irvine complex, 8 to 35 percent slopes

Setting

Landform:

- Kerrdam—Lake plains or terraces
- Round Butte—Lake plains or terraces
- Irvine—Lake plains or terraces

Position on landform:

- Kerrdam—Dissected or incised treads
- Round Butte—Dissected or incised treads
- Irvine—Dissected or incised treads

Slope:

- Kerrdam—8 to 20 percent
- Round Butte—8 to 15 percent
- Irvine—8 to 35 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kerrdam and similar soils: 30 percent
 Round Butte and similar soils: 30 percent
 Irvine and similar soils: 25 percent

Minor Components

Slopes less than 8 percent: 0 to 5 percent
 Areas of lake sediment outcrop: 0 to 5 percent
 Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Kerrdam

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.0 inches

Round Butte

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.7 inches

Irvine

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Koyokee Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans and stream terraces

Parent material: Tertiary sediments

Slope range: 4 to 30 percent

Elevation: 2,800 to 3,200 feet

Annual precipitation: 14 to 16 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 115 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Mollic Haploxeralfs

Typical Pedon

Koyokee gravelly loam, 4 to 15 percent slopes, in an area of rangeland, 2,500 feet south and 2,200 feet west of the northeast corner of sec. 31, T. 23 N., R. 23 W.

A—0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, fine, and medium and few coarse roots; 20 percent pebbles; neutral; clear wavy boundary.

Bt—3 to 11 inches; light brownish gray (10YR 6/2) very gravelly silty clay, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, firm, very sticky, very plastic; common very fine, fine, and medium and few coarse roots; many prominent clay films on faces of peds; 10 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

Btk—11 to 19 inches; pale brown (10YR 6/3) very cobbly clay loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; hard, firm, very sticky, very plastic; few very fine roots; common distinct clay films on face of peds; 25 percent cobbles and 25 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—19 to 60 inches; light yellowish brown (10YR 6/4) very cobbly sandy clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; 25 percent cobbles and 25 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 10 to 20 inches

A horizon

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 moist

Chroma: 2, 3, or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

Btk horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Texture: Clay loam or silty clay

Clay content: 35 to 50 percent

Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Texture: Silty clay loam or sandy clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

67D—Koyokee gravelly loam, 4 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 4 to 15 percent

Elevation: 2,800 to 3,200 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 105 to 115 days

Composition

Major Components

Koyokee and similar soils: 85 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Minesinger stony loam: 0 to 5 percent

Minesinger gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

67E—Koyokee gravelly loam, 15 to 30 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Position on landform: Dissected or incised treads

Slope: 15 to 30 percent

Elevation: 2,800 to 3,200 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 105 to 115 days

Composition**Major Components**

Koyokee and similar soils: 85 percent

Minor Components

Minesinger stony loam: 0 to 5 percent

Minesinger gravelly loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Krause Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Rapid

Landform: Stream terraces and escarpments

Parent material: Volcanic ash over alluvium

Slope range: 2 to 45 percent

Elevation range: 2,500 to 4,000 feet

Annual precipitation: 17 to 22 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
Andic Haplustepts

Typical Pedon

Krause gravelly silt loam, 2 to 8 percent slopes, in an area of forestland, 1,000 feet south and 1,200 feet east of the northwest corner of sec. 19, T. 21 N., R. 25 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 2 inches; dark brown (10YR 3/3) gravelly silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine, fine, medium, and coarse roots; 15 percent pebbles; neutral; clear smooth boundary.

Bw—2 to 13 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; common very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; moderately acid; clear wavy boundary.

2E/Bw—13 to 31 inches; E part (80 percent) is brown (10YR 5/3) extremely gravelly loamy coarse sand, light gray (10YR 7/2) dry; B part (20 percent) is dark yellowish brown (10YR 4/4) extremely gravelly sandy loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky

structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 20 percent cobbles and 45 percent pebbles; slightly acid; gradual wavy boundary.

2C—31 to 60 inches; brown (10YR 5/3) extremely gravelly loamy coarse sand, light gray (10YR 7/2) dry; single grain; loose, nonsticky, nonplastic; few very fine, fine, medium, and coarse roots; 25 percent cobbles and 55 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 4 or 5 dry

Chroma: 1, 2, or 3

Clay content: 7 to 12 percent

Content of rock fragments: 10 to 60 percent—0 to 10 percent stones; 0 to 20 percent cobbles; 10 to 30 percent pebbles

Moist bulk density: 0.85 to 1.00 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 6.1 to 7.3

Bw horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry

Chroma: 3 or 4

Clay content: 7 to 12 percent

Content of rock fragments: 5 to 50 percent—0 to 20 percent cobbles; 5 to 30 percent pebbles

Moist bulk density: 0.85 to 1.00 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: E part: 6 or 7 dry; B part: 5 or 6 dry

Chroma: E part: 2 or 3; B part: 3 or 4

Texture: Loamy sand, loamy coarse sand, or sandy loam

Clay content: 2 to 10 percent

Content of rock fragments: 50 to 75 percent—5 to 20 percent cobbles; 45 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

2C horizon

Chroma: 2 or 3

Texture: Loamy sand, sand, or loamy coarse sand

Clay content: 0 to 5 percent

Content of rock fragments: 50 to 80 percent—5 to 25 percent cobbles; 40 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

34C—Krause gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 2,500 to 4,000 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Krause and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 5 percent

Krause stony silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

341C—Krause very cobbly silt loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent
Elevation: 3,400 to 3,700 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Krause and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
 Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Very cobbly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Volcanic ash over alluvium or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

834F—Krause gravelly silt loam, 15 to 45 percent slopes

Setting

Landform: Escarpments
Position on landform: Risers
Slope: 15 to 45 percent
Elevation: 2,800 to 3,200 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Krause and similar soils: 90 percent

Minor Components

Slopes greater than 45 percent: 0 to 5 percent
 Repp gravelly loam, cool: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained
Dominant parent material: Volcanic ash over alluvium or outwash
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lamoose Series

Depth class: Very deep
Drainage class: Poorly drained
Permeability: Moderate to the 2C horizon; rapid below this depth
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation: 2,500 to 4,000 feet
Annual precipitation: 14 to 28 inches
Annual air temperature: 39 to 45 degrees F
Frost-free period: 70 to 115 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Typic Endoaquolls

Typical Pedon

Lamoose silt loam, 0 to 2 percent slopes, in an area of pasture, 700 feet north and 1,100 feet west of the southeast corner of sec. 21, T. 18 N., R. 21 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; slightly alkaline; abrupt smooth boundary.

Bg—7 to 20 inches; dark gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry; common medium distinct dark yellowish brown (10YR 4/4) moist redox concentrations; weak coarse prismatic structure; slightly hard, friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; disseminated lime; slightly effervescent; slightly alkaline; abrupt smooth boundary.

2C—20 to 60 inches; dark grayish brown (10YR 4/2) very gravelly sand, light brownish gray (10YR 6/2)

moist; single grain; loose, nonsticky, nonplastic;
50 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 10 inches

Depth to the 2C horizon: 14 to 24 inches

Depth to the seasonal high water table: 12 to
24 inches (seasonal high water table at 0 to
12 inches in early spring)

Ap horizon

Value: 2 or 3 moist; 4 or 5 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

Bg horizon

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 1 or 2

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 7.8

2C horizon

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 1 or 2

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 70 percent—0 to
15 percent cobbles; 35 to 55 percent pebbles

Reaction: pH 6.6 to 7.8

4A—Lamoose loam, moist, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 3,000 to 4,000 feet

Mean annual precipitation: 20 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Lamoose and similar soils: 85 percent

Minor Components

Somewhat poorly drained soils: 0 to 7 percent

Areas without flooding: 0 to 5 percent

Slopes greater than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

9A—Lamoose silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,500 to 2,700 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Lamoose and similar soils: 85 percent

Minor Components

Gardencreek silty clay loam: 0 to 5 percent

Jocko gravelly loam: 0 to 5 percent

Slopes greater than 2 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 4.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Larchpoint Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate to 27 inches; rapid below this depth

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,200 to 4,200 feet

Annual precipitation: 20 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, acid, frigid
Typic Endoaquents

Typical Pedon

Larchpoint silt loam, 0 to 2 percent slopes, in an area of forestland, 1,800 feet south and 600 feet west of the northeast corner of sec. 3, T. 22 N., R. 31 W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; soft, friable, nonsticky, nonplastic; many very fine and fine roots; 10 percent pebbles; strongly acid; clear smooth boundary.

C—7 to 15 inches; very dark grayish brown (2.5Y 3/2) silt loam, light brownish gray (2.5Y 6/2) dry; weak coarse prismatic structure parting to moderate medium subangular blocky; soft, friable, slightly sticky, slightly plastic; many very fine and fine roots; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; 10 percent pebbles; strongly acid; gradual wavy boundary.

Cg—15 to 27 inches; gray (5Y 5/1) silt loam, light gray (5Y 7/1) dry; massive; soft, friable, nonsticky, nonplastic; common very fine and fine roots; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; 10 percent pebbles; strongly acid; gradual wavy boundary.

2Cg—27 to 31 inches; dark greenish gray (5GY 4/1) loamy coarse sand, light greenish gray (5GY 7/1) dry; single grain; loose, nonsticky, nonplastic; few

very fine roots; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; 10 percent pebbles; strongly acid; gradual wavy boundary.

3Cg—31 to 60 inches; gray (5Y 6/1) very gravelly loamy coarse sand, light gray (5Y 7/1) dry; single grain; loose, nonsticky, nonplastic; few very fine roots; common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; 10 percent cobbles and 40 percent pebbles; strongly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 3, 4, or 5 moist; 5, 6, or 7 dry

Clay content: 8 to 18 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 4.5 to 5.5

C horizon

Hue: 2.5Y or 10YR

Value: 3, 4, 5, or 6 moist; 5, 6, or 7 dry

Clay content: 8 to 18 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 4.5 to 5.5

Cg horizon

Hue: 5GY or 5Y

Value: 4 or 5 moist; 6 or 7 dry

Clay content: 8 to 18 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 4.5 to 5.5

2Cg horizon

Hue: 5GY or 5Y

Value: 4 or 5 moist; 6 or 7 dry

Clay content: 2 to 10 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 4.5 to 5.5

3Cg horizon

Hue: 5GY or 5Y

Value: 4, 5, or 6 moist; 6 or 7 dry

Clay content: 2 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles, 35 to 45 percent pebbles

Reaction: pH 4.5 to 5.5

65A—Larchpoint silt loam, 0 to 2 percent slopes**Setting***Landform:* Flood plains*Slope:* 0 to 2 percent*Elevation:* 2,200 to 2,800 feet*Mean annual precipitation:* 28 to 34 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Larchpoint and similar soils: 85 percent

Minor Components

Oldtrail gravelly sandy loam: 0 to 4 percent

Bigbeaver, occasionally flooded: 0 to 4 percent

Iffgulch and similar soils: 0 to 4 percent

Slopes greater than 2 percent: 0 to 3 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Poorly drained*Dominant parent material:* Alluvium*Native plant cover type:* Forestland*Flooding:* Occasional*Water table:* Apparent*Available water capacity:* Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lesier Series*Depth class:* Very deep*Drainage class:* Somewhat excessively drained*Permeability:* Moderately rapid*Landform:* Stream terraces*Parent material:* Alluvium*Slope range:* 2 to 30 percent*Elevation range:* 3,200 to 3,600 feet*Annual precipitation:* 26 to 30 inches*Annual air temperature:* 40 to 45 degrees F*Frost-free period:* 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Vitrandic Eutrudepts

Typical Pedon

Lesier gravelly silt loam, 2 to 8 percent slopes, in an area of forestland, 400 feet north and 1,500 feet east of the southwest corner of sec. 23, T. 25 N., R. 27 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; dark brown (10YR 3/3) gravelly silt loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky, nonplastic; many fine and medium and few coarse roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

Bw—1 to 10 inches; dark brown (10YR 4/3) gravelly silt loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky, nonplastic; many fine and medium and few coarse roots; 20 percent pebbles; moderately acid; abrupt wavy boundary.

2E—10 to 17 inches; brown (10YR 5/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; 10 percent cobbles and 30 percent pebbles; slightly acid; clear wavy boundary.

2Bk1—17 to 34 inches; pale brown (10YR 6/3) very gravelly sandy loam, very pale brown (10YR 8/3) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common medium and coarse roots; 20 percent cobbles and 40 percent pebbles; disseminated lime; common distinct lime coatings on undersides of rock fragments; strongly effervescent; slightly alkaline; gradual wavy boundary.

2Bk2—34 to 60 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, very pale brown (10YR 8/3) dry; weak fine subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; few medium and coarse roots; 30 percent cobbles and 45 percent pebbles; disseminated lime; many distinct lime coatings on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Depth to the Bk horizon: 13 to 26 inches

A horizon

Value: 3, 4, or 5 dry; 2, 3, or 4 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 25 percent—0 to

5 percent cobbles; 15 to 20 percent pebbles

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4 moist

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 25 percent—0 to

5 percent cobbles; 15 to 20 percent pebbles

Moist bulk density: 1.0 to 1.4 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 6.5

2E horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—

10 to 20 percent cobbles; 25 to 40 percent pebbles

Reaction: pH 6.1 to 7.8

2Bk1 horizon

Value: 6, 7, or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 50 to 60 percent—

15 to 20 percent cobbles; 35 to 40 percent pebbles

Calcium carbonate equivalent: 15 to 35 percent

Reaction: pH 7.4 to 9.0

2Bk2 horizon

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Loamy sand or sandy loam

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 80 percent—

20 to 35 percent cobbles; 40 to 45 percent pebbles

Calcium carbonate equivalent: 15 to 35 percent

Reaction: pH 7.4 to 9.0

99C—Lesier gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 3,200 to 3,600 feet

Mean annual precipitation: 26 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Lesier and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

99E—Lesier gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Stream terraces

Position on landform: Risers

Slope: 8 to 30 percent

Elevation: 3,200 to 3,600 feet

Mean annual precipitation: 26 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Lesier and similar soils: 90 percent

Minor Components

Lesier, stony: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lionwood Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Lake plains and terraces

Parent material: Volcanic ash over glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,300 to 2,800 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 115 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Vitrandic Hapludalfs

Typical Pedon

Lionwood loam, in an area of Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes, in an area of forestland, 1,300 feet south and 2,500 feet east of the northwest corner of sec. 10, T. 22 N., R. 30 W.

Oi—1 inch to 0; slightly decomposed forest litter.

A—0 to 5 inches; dark grayish brown (10YR 4/2)

loam, light brownish gray (10YR 6/2) dry;

moderate very fine and fine granular structure;

soft, very friable, nonsticky, nonplastic; many very

fine, fine, medium, and coarse roots; moderately

acid; clear wavy boundary.

E1—5 to 17 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) dry; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

E2—17 to 26 inches; brown (10YR 5/3) very fine sandy loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; moderately acid; abrupt wavy boundary.

Bt and E—26 to 47 inches; B part (60 percent) is yellowish brown (10YR 5/4) 1/2- to 2-inch thick fine sandy loam lamellae, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; many distinct clay films bridging sand grains; moderately acid; E part (40 percent) is very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; moderately acid; abrupt wavy boundary.

2Bt—47 to 52 inches; light yellowish brown (10YR 6/4) clay, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine, medium, and coarse roots; many distinct clay films on faces of peds; moderately acid; abrupt wavy boundary.

3Bt and E—52 to 60 inches; B part (60 percent) is yellowish brown (10YR 5/4) 1- to 3-inch thick fine sandy loam lamellae, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; many distinct clay films bridging sand grains; slightly acid. E part (40 percent) is brown (10YR 5/3) loam, very pale brown (10YR 7/3) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the 2Bt horizon: Greater than 40 inches

A horizon

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 8 to 15 percent

Moist bulk density: 1.0 to 1.40 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent
 Reaction: pH 5.1 to 6.5

E horizons

Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Texture: Loam or very fine sandy loam
 Clay content: 5 to 15 percent
 Moist bulk density: 1.0 to 1.40 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent
 Reaction: pH 5.1 to 6.5

Bt and E horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Clay content: B part: 10 to 20 percent; E part: 2 to 10 percent
 Reaction: pH 5.6 to 6.5

2Bt horizon

Hue: 10YR, 7.5YR, or 5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Clay content: 40 to 50 percent
 Reaction: pH 5.6 to 7.3

3Bt and E horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Clay content: B part: 10 to 20 percent; E part: 8 to 15 percent
 Reaction: pH 5.6 to 7.3

64B—Lionwood loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Lionwood and similar soils: 85 percent

Minor Components

Scotmont fine sandy loam: 0 to 7 percent

Whitepine silt loam: 0 to 6 percent

Slopes greater than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

641D—Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes

Setting

Landform:

- Lionwood—Lake plains or terraces
- Scotmont—Lake plains or terraces
- Whitepine—Lake plains or terraces

Position on landform:

- Lionwood—Treads
- Scotmont—Treads
- Whitepine—Treads

Slope:

- Lionwood—4 to 15 percent
- Scotmont—4 to 15 percent
- Whitepine—4 to 15 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Lionwood and similar soils: 45 percent

Scotmont and similar soils: 30 percent

Whitepine and similar soils: 15 percent

Minor Components

Slopes greater than 15 percent: 0 to 2 percent

Slopes less than 4 percent: 0 to 2 percent

Fernline silt loam: 0 to 2 percent

Bonnash gravelly silt loam: 0 to 2 percent

Iffgulch and similar soils: 0 to 2 percent

Major Component Description

Lionwood

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.6 inches

Scotmont

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

Whitepine

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

641E—Lionwood-Scotmont-Whitepine complex, 15 to 35 percent slopes

Setting

Landform:

- Lionwood—Lake plains or terraces
- Scotmont—Lake plains or terraces
- Whitepine—Lake plains or terraces

Position on landform:

- Lionwood—Dissected or incised treads
- Scotmont—Dissected or incised treads
- Whitepine—Dissected or incised treads

Slope:

- Lionwood—15 to 35 percent
- Scotmont—15 to 35 percent
- Whitepine—15 to 35 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Lionwood and similar soils: 40 percent

Scotmont and similar soils: 35 percent

Whitepine and similar soils: 15 percent

Minor Components

Slopes greater than 35 percent: 0 to 2 percent

Slopes less than 15 percent: 0 to 2 percent

Fernline silt loam: 0 to 2 percent

Bonnash gravelly silt loam: 0 to 2 percent

Iffgulch and similar soils: 0 to 2 percent

Major Component Description

Lionwood

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.6 inches

Scotmont

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

Whitepine

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Loneman Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Volcanic ash over colluvium

Slope range: 15 to 60 percent

Elevation range: 3,600 to 4,600 feet

Annual precipitation: 28 to 32 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Paleudalfs

Typical Pedon

Loneman silt loam, 35 to 60 percent slopes, in an area of forestland, 2,200 feet north and 1,500 feet east of the southwest corner of sec. 33, T. 22 N., R. 26 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; 10 percent pebbles; neutral; abrupt wavy boundary.

Bw—1 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; 10 percent pebbles; slightly acid; abrupt wavy boundary.

2E—9 to 26 inches; grayish brown (2.5Y 5/2) very gravelly loam, light brownish gray (2.5Y 6/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; common very fine and fine and few medium and coarse roots; 10 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

2E/Bt—26 to 40 inches; E part (70 percent) very pale brown (10YR 7/3) very gravelly loam, very pale brown (10YR 8/3) dry; B part (30 percent) yellowish brown (10YR 4/4) very gravelly clay loam, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few fine and medium and common coarse roots; common distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

2Bt—40 to 60 inches; yellowish brown (10YR 5/6) very gravelly clay loam, brownish yellow (10YR 6/6) dry; moderate medium subangular blocky

structure; very hard, firm, moderately sticky, moderately plastic; common medium and coarse roots; many distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 7.3

Bw horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 4 or 6

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 5.6 to 7.3

2E horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—5 to 15 percent cobbles; 30 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

2E/Bt horizon

Hue: E part: 7.5YR, 10YR, or 2.5Y; B part: 7.5YR or 10YR

Value: E part: 6, 7, or 8 dry, 5, 6, or 7 moist; B part: 6 or 7 dry, 4, 5, or 6 moist

Chroma: E part: 3, 4, 6, or 8; B part: 4 or 6

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

2Bt horizon

Hue: 7.5YR or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 6 or 8

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 50 percent—
10 to 20 percent cobbles; 25 to 40 percent
pebbles

Reaction: pH 5.6 to 7.3

884E—Loneman silt loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,600 to 4,600 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Loneman and similar soils: 85 percent

Minor Components

Bignell gravelly loam: 0 to 4 percent

Slopes greater than 35 percent: 0 to 4 percent

Sharrott gravelly loam, cool: 0 to 3 percent

Loneman silt loam, stony: 0 to 2 percent

Loneman silt loam, bouldery: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

884F—Loneman silt loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,600 to 4,600 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Loneman and similar soils: 85 percent

Minor Components

Slopes greater than 60 percent: 0 to 4 percent

Bignell gravelly loam: 0 to 4 percent

Sharrott gravelly loam, cool: 0 to 3 percent

Loneman silt loam, stony: 0 to 2 percent

Loneman silt loam, bouldery: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
colluvium

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lonepine Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 2 to 20 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 40 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed, active, frigid
Calcic Haploxerepts

Typical Pedon

Lonepine silt loam, 2 to 8 percent slopes, in an area of cropland, 100 feet south and 2,600 feet west of the northeast corner of sec. 25, T. 21 N., R. 21 W. (Lake County, Montana)

Ap—0 to 6 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak

fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; few very fine pores; neutral (pH 7.0); abrupt wavy boundary. (4- to 10-inches thick)

Bw—6 to 14 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak coarse blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; neutral (pH 7.2); abrupt wavy boundary. (3- to 12-inches thick)

Bk—14 to 19 inches; white (10YR 8/2) silt loam, brown (10YR 5/3) moist; moderate medium platy structure of varve remnants; hard, very friable, slightly sticky, slightly plastic; few roots and pores; disseminated lime and common medium soft masses of lime; strongly effervescent; moderately alkaline (pH 8.4); gradual irregular boundary (4- to 10-inches thick).

C—19 to 60 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; massive, consisting of 1/4- to 1/2-inch thick varves; very friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline (pH 8.4).

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 11 to 20 inches

Depth to the varves: 18 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 12 to 25 percent

Reaction: pH 6.6 to 7.3

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.3

Bk horizon

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.9 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.9 to 8.4

15B—Lonepine silt loam, 2 to 8 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 2 to 8 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lonepine and similar soils: 85 percent

Minor Components

Round Butte silty clay loam: 0 to 4 percent

Slopes greater than 8 percent: 0 to 4 percent

Vincom silt loam: 0 to 4 percent

Gardencreek silty clay loam: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

15D—Lonepine-Vincom silt loams, 4 to 15 percent slopes

Setting

Landform:

- Lonepine—Lake plains or terraces
- Vincom—Lake plains or terraces

Position on landform:

- Lonepine—Dissected or incised treads
- Vincom—Dissected or incised treads

Slope:

- Lonepine—4 to 15 percent
- Vincom—8 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lonepine and similar soils: 60 percent

Vincom and similar soils: 25 percent

Minor Components

Round Butte silty clay loam: 0 to 5 percent

Dryfork silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Lonepine

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.8 inches

Vincom

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

215B—Lonepine-Round Butte complex, 2 to 8 percent slopes

Setting

Landform:

- Lonepine—Lake plains or terraces
- Round Butte—Lake plains or terraces

Slope:

- Lonepine—2 to 8 percent
- Round Butte—2 to 8 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lonepine and similar soils: 50 percent

Round Butte and similar soils: 35 percent

Minor Components

Vincom silt loam: 0 to 6 percent

Slopes greater than 8 percent: 0 to 6 percent

Sonyok silty clay loam: 0 to 3 percent

Major Component Description

Lonepine

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.8 inches

Round Butte

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Loonlake Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces and outwash plains

Parent material: Volcanic ash over alluvium or outwash

Slope range: 4 to 30 percent

Elevation range: 3,300 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Paleudalfs

Typical Pedon

Loonlake gravelly silt loam, 4 to 15 percent slopes, in an area of forestland, 1,800 feet north and 700 feet west of the southeast corner of sec. 22, T. 27 N., R. 28 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

Bw—0 to 9 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure parting to moderate fine granular; slightly hard, very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 15 percent pebbles; moderately acid; clear wavy boundary.

2E—9 to 24 inches; brown (10YR 5/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; slightly hard, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; 10 percent cobbles and 35 percent pebbles; moderately acid; gradual wavy boundary.

2E/Bt—24 to 36 inches; E part (80 percent) is brown (10YR 5/3) extremely cobbly sandy loam, very pale brown (10YR 7/3) dry; B part (20 percent) is

dark brown (10YR 4/3) extremely cobbly sandy clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 30 percent cobbles and 40 percent pebbles; moderately acid; gradual wavy boundary.

2Bt—36 to 60 inches; dark brown (10YR 4/3) very gravelly sandy clay loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common medium and few coarse roots; continuous faint clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the 2Bt horizon: 27 to 38 inches

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 5 to 15 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.2 percent

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.6 to 7.3

2E horizon

Value: 6 or 7 dry; 5 or 6 moist

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 50 percent—5 to 15 percent cobbles; 30 to 35 percent pebbles

Reaction: pH 5.6 to 7.3

2E/Bt horizon

Value: 6 or 7 dry; 4 or 5 moist

Clay content, mixed: 5 to 15 percent

Content of rock fragments: 60 to 80 percent—20 to 35 percent cobbles; 40 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

2Bt horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 20 to 30 percent

Content of rock fragments: 45 to 60 percent—10 to 20 percent cobbles; 35 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

71D—Loonlake gravelly silt loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces and outwash plains
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 3,300 to 3,800 feet
Mean annual precipitation: 24 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Loonlake and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 3 percent
 Slopes less than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

71E—Loonlake gravelly silt loam, 15 to 30 percent slopes

Setting

Landform: Stream terraces and outwash plains
Position on landform: Risers
Slope: 15 to 30 percent
Elevation: 3,300 to 3,800 feet
Mean annual precipitation: 24 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Loonlake and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 3 percent
 Slopes less than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Flooding: None
Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Lozeau Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Colluvium and residuum derived from
 semiconsolidated welded tuff
Slope range: 8 to 50 percent
Elevation: 3,000 to 3,700 feet
Annual precipitation: 22 to 24 inches
Annual air temperature: 39 to 42 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Fine-loamy, mixed, active, frigid
 Glossic Hapludalfs

Typical Pedon

Lozeau gravelly loam, 8 to 30 percent slopes, in an area of forestland, 3,450 feet north and 2,600 feet east of the southwest corner of sec. 5, T. 24 N., R. 24 W.

Oi—1 inch to 0; undecomposed and partially decomposed forest litter.

A—0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, and slightly plastic; common very fine, fine, and medium roots; 20 percent pebbles; moderately acid; clear smooth boundary.

E/Bw—3 to 16 inches; E part (65 percent) is light brownish gray (10YR 6/2) gravelly loam, grayish brown (10YR 5/2) moist; B part (35 percent) is pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine and common fine and medium roots; few fine and medium tubular pores; 20 percent pebbles; moderately acid; clear smooth boundary.

Bt/E—16 to 32 inches; B part (65 percent) is light yellowish brown (10YR 6/4) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; E part (35 percent) is very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; few fine and common medium roots; common fine tubular pores; common faint clay films on faces of peds and lining pores; 5 percent cobbles, 15 percent pebbles, and 15 percent soft fragments; slightly acid; gradual smooth boundary.

Cr—32 to 60 inches; semiconsolidated welded tuff.

Range in Characteristics

Soil temperature: 41 to 43 degrees F

Moisture control section: Between 4 and 12 inches

Depth to semiconsolidated welded tuff: 20 to 40 inches

Notes: Some profiles may contain an E and/or BC horizon. When mixed to 7 inches, the surface layer fails to meet the requirements of a mollic epipedon.

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 35 percent—
15 to 30 percent pebbles; 0 to 5 percent cobbles

Reaction: pH 5.6 to 6.5

E/Bw horizon

Hue: 10YR or 2.5Y

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Clay content: 10 to 27 percent

Content of rock fragments: 10 to 35 percent—
10 to 30 percent pebbles; 0 to 5 percent cobbles

Reaction: pH 5.6 to 6.5

Bt/E horizon

Hue: 10YR or 2.5Y

Value: B part: 5 or 6 dry, 4 or 5 moist; E part: 6 or 7 dry, 5 or 6 moist

Chroma: B part: 3, 4, or 6; E part: 2 or 3

Texture: Loam, clay loam, or sandy clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 5 to 60 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles; 0 to 25 percent soft fragments

Reaction: pH 5.6 to 6.5

84E—Lozeau gravelly loam, 8 to 30 percent slopes

Setting

Landform: Mountains

Slope: 8 to 30 percent

Elevation: 3,000 to 3,700 feet

Mean annual precipitation: 22 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Lozeau and similar soils: 85 percent

Minor Components

Pashua gravelly loam: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

84F—Lozeau gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 3,000 to 3,700 feet

Mean annual precipitation: 22 to 24 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Lozeau and similar soils: 85 percent

Minor Components

Pashua gravelly loam: 0 to 5 percent

Areas of welded tuff outcrop: 0 to 5 percent

Slopes greater than 50 percent: 0 to 3 percent

Slopes less than 30 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Marklepass Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, mixed, superactive, frigid
Typic Natrixeralfs

Typical Pedon

Marklepass silty clay loam (mixed), in an area of Marklepass-Slickspots complex, 0 to 4 percent slopes, in an area of rangeland, 1,850 feet north and 360 feet east of the southwest corner of sec. 25, T. 23 N., R. 24 W.

A1—0 to 1 inch; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; strong fine and medium granular structure; slightly hard, firm, moderately sticky, slightly plastic; common fine and few medium roots; slightly effervescent; very strongly alkaline; clear smooth boundary.

A2—1 to 7 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure; slightly hard, firm, moderately sticky, slightly plastic; common fine and few medium roots; slightly effervescent; very strongly alkaline; clear smooth boundary.

Btn1—7 to 15 inches; light grayish brown (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to strong medium angular blocky; very hard, very firm, very sticky, moderately plastic; common fine and few medium roots; many distinct clay films on faces of peds; slightly effervescent; very strongly alkaline; clear smooth boundary.

Btn2—15 to 24 inches; light yellowish brown (2.5Y 6/4) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; very hard, very firm, very sticky, moderately plastic; few fine roots; many distinct clay films on faces of peds; slightly effervescent; very strongly alkaline; clear smooth boundary.

Bkn—24 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard; friable, slightly sticky, slightly plastic; few fine roots; few fine threads of lime; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bkn horizon: 10 to 25 inches

A1 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 8.5 to 9.6

A2 horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 40 to 75

Reaction: pH 8.5 to 9.6

Btn horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 0 to 4

Sodium adsorption ratio: 45 to 120

Reaction: pH 8.5 to 9.6

Bkn horizon

Hue: 10YR or 2.5Y

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 50 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 2 to 8

Sodium adsorption ratio: 45 to 100

Reaction: pH 8.5 to 9.6

**12A—Marklepass silty clay loam,
0 to 2 percent slopes**

Setting

Landform: Lake plains or terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marklepass and similar soils: 85 percent

Minor Components

Areas of slickspots: 0 to 4 percent

Round Butte silty clay loam: 0 to 4 percent

Slopes greater than 2 percent: 0 to 4 percent

Bohnly silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**112A—Marklepass-Slickspots complex,
0 to 4 percent slopes**

Setting

Landform: Lake plains or terraces

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marklepass and similar soils: 55 percent

Areas of slickspots: 30 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Round Butte silty clay loam: 0 to 5 percent

Bohnly silt loam: 0 to 5 percent

Major Component Description

Marklepass

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.7 inches

Slickspots

Definition: Areas of loamy or clayey soil with excess exchangeable sodium and low productivity.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

McCollum Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately rapid

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation: 2,400 to 3,000 feet

Annual precipitation: 15 to 19 inches

Annual air temperature: 40 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Haploxerolls

Typical Pedon

McCollum fine sandy loam, 0 to 4 percent slopes, in an area of hayland, 1,500 feet north and 2,600 feet east of the southwest corner of sec. 9, T. 18 N., R. 25 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium and coarse roots; neutral; clear wavy boundary.

Bw—10 to 21 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine and few medium and coarse roots; neutral; clear wavy boundary.

C—21 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the mollic epipedon: 10 to 20 inches

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 8 to 18 percent

Reaction: pH 6.1 to 7.3

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 8 to 18 percent

Reaction: pH 6.1 to 7.3

C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loamy fine sand

Clay content: 8 to 18 percent

Reaction: pH 6.6 to 7.8

**35C—McCollum fine sandy loam,
4 to 8 percent slopes****Setting**

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 8 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 16 to 19 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

McCollum and similar soils: 85 percent

Minor Components

Grantsdale silt loam: 0 to 3 percent

Sacheen loamy fine sand: 0 to 3 percent

Slopes greater than 8 percent: 0 to 3 percent

Horseplains, occasionally flooded: 0 to 2 percent

Gird silt loam: 0 to 2 percent

Slopes less than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

292B—McCollum fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 2,400 to 3,000 feet
Mean annual precipitation: 15 to 17 inches
Frost-free period: 105 to 125 days

Composition

Major Components

McCollum and similar soils: 85 percent

Minor Components

Grantsdale silt loam: 0 to 5 percent
 Gird silt loam: 0 to 3 percent
 Sacheen loamy fine sand: 0 to 3 percent
 Slopes greater than 4 percent: 0 to 3 percent
 Horseplains, occasionally flooded: 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

351C—McCollum-Belton fine sandy loams, 4 to 8 percent slopes

Setting

Landform:
 • McCollum—Stream terraces
 • Belton—Stream terraces
Position on landform:
 • McCollum—Treads
 • Belton—Treads
Slope:
 • McCollum—4 to 8 percent
 • Belton—4 to 8 percent
Elevation: 2,600 to 3,000 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 105 to 125 days

Composition

Major Components

McCollum and similar soils: 45 percent
 Belton and similar soils: 40 percent

Minor Components

Bemishave loam: 0 to 5 percent
 Gird silt loam: 0 to 5 percent
 Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

McCollum
Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

Belton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

351D—McCollum-Belton fine sandy loams, 8 to 15 percent slopes

Setting

Landform:

- McCollum—Stream terraces
- Belton—Stream terraces

Position on landform:

- McCollum—Dissected or incised treads
- Belton—Dissected or incised treads

Slope:

- McCollum—8 to 15 percent
- Belton—8 to 15 percent

Elevation: 2,600 to 3,000 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 105 to 125 days

Composition

Major Components

McCollum and similar soils: 65 percent

Belton and similar soils: 20 percent

Minor Components

Bemishave loam: 0 to 5 percent

Gird silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

McCollum

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.8 inches

Belton

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 8.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

McDonald Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Alluvial fans, stream terraces, and hills

Parent material: Tertiary sediments

Slope range: 2 to 30 percent

Elevation: 3,300 to 4,800 feet

Annual precipitation: 17 to 19 inches

Annual air temperature: 39 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine, illitic, frigid Alfic Argixerolls

Typical Pedon

McDonald silt loam, 8 to 15 percent slopes, in an area of rangeland, 1,700 feet south and 1,700 feet east of the northwest corner of sec. 10, T. 17 N., R. 21 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; 5 percent pebbles; neutral; clear smooth boundary.

E—10 to 13 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; moderate fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; 5 percent pebbles; neutral; clear smooth boundary.

Bt1—13 to 20 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

Bt2—20 to 34 inches; pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

Bk—34 to 60 inches; white (2.5Y 8/2) gravelly silty clay loam, light brownish gray (2.5Y 6/2) moist; weak fine subangular blocky structure; slightly

hard, very friable, slightly sticky, slightly plastic; few faint clay films on faces of peds; 20 percent pebbles; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 10 to 16 inches

Depth to the Bk horizon: 24 to 40 inches

Ap horizon

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 5 to 15 percent—0 to 2 percent stones; 0 to 3 percent cobbles; 5 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

E horizon

Clay content: 20 to 27 percent

Content of rock fragments: 5 to 15 percent—0 to 2 percent stones; 0 to 3 percent cobbles; 5 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent stones; 0 to 10 percent cobbles; 0 to 20 percent pebbles

Reaction: pH 6.6 to 7.3

Bk horizons

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 5 to 35 percent—0 to 5 percent stones; 0 to 10 percent cobbles; 5 to 20 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

58B—McDonald silt loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Position on landform: Footslopes and toeslopes

Slope: 2 to 8 percent

Elevation: 3,300 to 4,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

McDonald and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 9 percent

Slopes greater than 8 percent: 0 to 6 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

58D—McDonald silt loam, 8 to 15 percent slopes

Setting

Landform: Hills

Position on landform: Backslopes, footslopes, and side slopes

Slope: 8 to 15 percent

Elevation: 3,300 to 4,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

McDonald and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 9 percent

Slopes greater than 15 percent: 0 to 6 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

58E—McDonald silt loam, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 3,300 to 4,800 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

McDonald and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 9 percent

Slopes greater than 30 percent: 0 to 6 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

McLangor Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderate

Landform: Flood plains and closed depressions

Parent material: Organic materials over alluvium

Slope range: 0 to 2 percent

Elevation range: 2,400 to 3,800 feet

Annual precipitation: 12 to 30 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 70 to 110 days

Taxonomic Class: Loamy, mixed, euic, frigid Terric Haplohemists

Typical Pedon

McLangor mucky peat, 0 to 2 percent slopes, in an area of wet meadow hayland, 1,900 feet north and 300 feet east of the southwest corner of sec. 33, T. 26 N., R. 26 W.

- Oe1—0 to 8 inches; black (10YR 2/1) broken face and rubbed mucky peat (hemic material); 70 percent fiber and raw herbaceous plant material—30 percent rubbed; massive; nonsticky nonplastic; herbaceous fiber, mostly residue from *Phragmites arundinacea*; many very fine and fine roots; slightly acid; gradual smooth boundary.
- Oe2—8 to 17 inches; black (10YR 2/1) broken face and rubbed mucky peat (hemic material); 50 percent fiber—20 percent rubbed; massive; nonsticky nonplastic; herbaceous fiber; common very fine and fine roots; slightly acid; clear smooth boundary.
- C1—17 to 20 inches; stratified ($\frac{1}{4}$ to $\frac{1}{2}$ inch) very dark gray (10YR 3/1) mucky silt loam (50 percent), dark gray (10YR 4/1) silt loam (40 percent), and black (10YR 2/1) mucky silt loam (10 percent); massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; neutral; abrupt smooth boundary.
- C2—20 to 36 inches; stratified ($\frac{1}{4}$ to $\frac{1}{2}$ inch) light gray (10YR 7/2) silt and very fine sandy loam; massive; soft, very friable, nonsticky, nonplastic;

common very fine and fine roots; neutral; abrupt wavy boundary.

- C3—36 to 42 inches; stratified ($\frac{1}{4}$ to $\frac{3}{4}$ inch) very dark gray (10YR 3/1) mucky silt loam (60 percent), dark gray (10YR 4/1) silt loam (30 percent), and black (10YR 2/1) mucky peat (10 percent); massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; slightly acid; clear wavy boundary.
- Oa—42 to 54 inches; black (10YR 2/1) broken face and rubbed muck (sapric material); 30 percent fiber—5 percent rubbed; massive; nonsticky nonplastic; herbaceous fiber; common very fine and fine roots; moderately acid; abrupt wavy boundary.
- Cg—54 to 60 inches; stratified ($\frac{1}{4}$ to $\frac{1}{2}$ inch) light gray (5Y 6/1) silt and silt loam; massive; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Thickness of organic material: Less than 51 inches

Depth to the seasonal high water table: 0 to 12 inches

Depth to the C horizon: 16 to 34 inches

Depth to the Cg horizon: 38 to 54 inches

Notes: Some pedons have an Oe3 horizon. The combined thickness of the Oe1, Oe2, and Oe3 (if present) horizons is 16 to 34 inches. An Oe' horizon is present in some pedons in place of the Oa horizon.

Oe1 and Oe2 horizons

Value: 2 or 3

Chroma: 1 or 2

Fiber content, unrubbed: 40 to 70 percent

Fiber content, rubbed: 20 to 30 percent

Reaction: pH 5.6 to 6.5

C1 horizon

Value: 2, 3, or 4

Chroma: 1 or 2

Texture: Silt loam or mucky silt loam

Clay content: 5 to 15 percent

Reaction: pH 5.6 to 7.3

C2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 7 or 8

Chroma: 1 or 2

Texture: Stratified silt, very fine sandy loam, loamy very fine sand, or silt loam; averaging less than 15 percent fine sand or coarser

Clay content: 4 to 12 percent

Reaction: pH 5.6 to 7.3

C3 horizon

Value: 2, 3, or 4

Chroma: 1 or 2

Texture: Mucky silt loam or silt loam

Clay content: 5 to 15 percent

Reaction: pH 5.6 to 6.5

Oa horizon

Value: 2 or 3

Fiber content, unrubbed: 20 to 30 percent

Fiber content, rubbed: 5 to 15 percent

Reaction: pH 5.6 to 6.5

Cg horizon

Hue: 5Y, 5GY, 5G, or 5BG

Value: 5, 6, or 7

Chroma: 1 or 2

Texture: Stratified silt, silt loam, very fine sandy loam, loamy very fine sand, or very fine sand; averaging less than 15 percent fine sand or coarser

Clay content: 4 to 15 percent

Reaction: pH 5.6 to 6.5

99A—McLangor-Meadowpeak complex, 0 to 2 percent slopes

Setting

Landform:

- McLangor—Closed depressions
- Meadowpeak—Closed depressions

Slope:

- McLangor—0 to 2 percent
- Meadowpeak—0 to 2 percent

Elevation: 2,400 to 3,200 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 90 to 110 days

Composition

Major Components

McLangor and similar soils: 45 percent

Meadowpeak and similar soils: 40 percent

Minor Components

Slopes greater than 2 percent: 0 to 10 percent

Areas of open water: 0 to 5 percent

Major Component Description

McLangor

Surface layer texture: Mucky-peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Organic deposits

Native plant cover type: Rangeland

Flooding: Frequent

Water table: Apparent

Available water capacity: Mainly 16.0 inches

Meadowpeak

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Water table: Apparent

Available water capacity: Mainly 10.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

807A—McLangor mucky peat, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

McLangor and similar soils: 90 percent

Minor Components

Blacklake mucky peat: 0 to 7 percent

Meadowpeak, occasionally flooded: 0 to 3 percent

Major Component Description

Surface layer texture: Mucky-peat

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Organic deposits

Native plant cover type: Rangeland

Flooding: Frequent

Water table: Apparent

Available water capacity: Mainly 16.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Meadowpass Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Hills

Parent material: Colluvium and residuum derived from semiconsolidated welded tuff

Slope range: 2 to 8 percent

Elevation: 3,200 to 3,800 feet

Annual precipitation: 16 to 18 inches

Average air temperature: 39 to 42 degrees F

Frost-free period: 100 to 110 days

Taxonomic Class: Fine, mixed, active, frigid Typic Argixerolls

Typical Pedon

Meadowpass gravelly loam, 2 to 8 percent slopes, in an area of rangeland, 900 feet north and 2,900 feet east of the southwest corner of sec. 11, T. 24 N., R. 24 W.

A1—0 to 3 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; 15 percent pebbles; slightly acid; clear smooth boundary.

A2—3 to 9 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; few fine tubular pores; 5 percent cobbles and 15 percent pebbles; slightly acid; clear smooth boundary.

Bt1—9 to 12 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky, moderately plastic; many very fine and fine and few medium roots; common fine tubular

pores; few faint clay films on faces of peds; 5 percent cobbles and 15 percent pebbles; slightly acid; clear smooth boundary.

Bt2—12 to 18 inches; pale brown (10YR 6/3) sandy clay, brown (10YR 4/3) moist; weak coarse prismatic structure parting to strong medium angular blocky; hard, firm, moderately sticky, very plastic; common very fine and fine and few medium roots; common very fine and fine interstitial and tubular pores; common prominent clay films on faces of peds and in pores; 10 percent pebbles and 15 percent soft fragments; neutral; gradual smooth boundary.

Bt/C—18 to 30 inches; B part (60 percent) is light olive brown (2.5Y 5/4) sandy clay, olive brown (2.5Y 4/4) moist; C part (40 percent) is pale yellow (2.5Y 7/4) sandy clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; slightly hard, firm, moderately sticky, very plastic; few very fine and fine roots along prism faces; few tubular and interstitial pores; common distinct clay films on faces of peds; 10 percent pebbles and 40 percent soft fragments; neutral; gradual smooth boundary.

Cr—30 to 60 inches; semiconsolidated welded tuff.

Range in Characteristics

Soil temperature: 41 to 44 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the Cr horizon: 20 to 40 inches

A horizons

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 27 percent

Content of rock fragments: 15 to 45 percent—0 to 10 percent cobbles; 15 to 35 percent pebbles

Reaction: pH 6.1 to 7.3

Bt1 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Content of rock fragments: 10 to 45 percent—0 to 5 percent cobbles; 10 to 30 percent pebbles; 0 to 10 percent soft fragments

Reaction: pH 6.1 to 7.3

Bt2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Sandy clay or clay

Clay content: 35 to 60 percent

Content of rock fragments: 15 to 50 percent—5 to 25 percent pebbles; 10 to 25 percent soft fragments

Reaction: pH 6.1 to 7.3

Bt/C horizon

Hue: 10YR or 2.5Y

Value: B part: 5 or 6 dry, 4 or 5 moist; C part: 6 or 7 dry, 5 or 6 moist

Chroma: B part: 3, 4, or 6; C part: 3 or 4

Texture: Sandy clay or sandy clay loam

Clay content: 30 to 50 percent

Content of rock fragments: 10 to 70 percent—5 to 25 percent pebbles; 5 to 45 percent soft fragments

Reaction: pH 6.1 to 7.3

69B—Meadowpass gravelly loam, 2 to 8 percent slopes

Setting

Landform: Hills

Position on landform: Summits of hills

Slope: 2 to 8 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Meadowpass and similar soils: 85 percent

Minor Components

Battlebutte gravelly loam: 0 to 9 percent

Slopes greater than 8 percent: 0 to 6 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Tuff residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Meadowpeak Series

Depth class: Very deep

Drainage class: Poorly drained

Permeability: Moderate

Landform: Flood plains and closed depressions

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 2,200 to 3,800 feet

Annual precipitation: 24 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-silty, mixed, superactive, nonacid, frigid Aeric Fluvaquents

Typical Pedon

Meadowpeak silt loam, in an area of Meadowpeak-Firetower silt loams, 0 to 2 percent slopes, in an area of forestland, 2,400 feet south and 1,800 feet east of the northwest corner of sec. 23, T. 27 N., R. 28 W.

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; slightly acid; clear wavy boundary.

AC—4 to 9 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; slightly acid; clear wavy boundary.

C1—9 to 16 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, medium, and coarse roots; slightly acid; clear wavy boundary.

C2—16 to 25 inches; olive gray (5Y 5/2) silt loam, light gray (5Y 7/2) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, medium, and coarse roots; neutral; gradual wavy boundary.

C3—25 to 34 inches; olive gray (5Y 5/2) and very dark grayish brown (10YR 3/2) silt loam consisting of thin layers of silt loam and loam, light gray (5Y 7/2) and grayish brown (10YR 5/2) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; neutral; gradual wavy boundary.

C4—34 to 60 inches; white (5Y 8/1) silt loam, light brownish gray (2.5Y 6/2) dry; few fine distinct olive yellow (5Y 6/6) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine, medium, and coarse roots; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: 12 to 24 inches

A horizon

Value: 2 or 3 moist; 3 or 4 dry

Clay content: 12 to 18 percent

Reaction: pH 5.6 to 6.5

AC horizon

Clay content: 12 to 18 percent

Reaction: pH 5.6 to 7.3

C1 and C2 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 moist; 5, 6, or 7 dry

Chroma: 1 or 2

Clay content: 12 to 18 percent

Reaction: pH 5.6 to 7.3

C3 and C4 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3, 4, 5, or 6 moist; 5, 6, 7, or 8 dry

Chroma: 1 or 2

Texture: Silt loam or loam

Clay content: 10 to 18 percent

Reaction: pH 5.6 to 7.3

73A—Meadowpeak silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,300 to 3,800 feet

Mean annual precipitation: 24 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Meadowpeak and similar soils: 85 percent

Minor Components

Meadowpeak, frequently flooded: 0 to 5 percent

Firetower silt loam: 0 to 5 percent

Blacklake mucky peat: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 10.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

731A—Meadowpeak-Firetower silt loams, 0 to 2 percent slopes

Setting

Landform:

- Meadowpeak—Flood plains
- Firetower—Stream terraces

Position on landform:

- Firetower—Treads

Slope:

- Meadowpeak—0 to 2 percent
- Firetower—0 to 2 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Meadowpeak and similar soils: 60 percent

Firetower and similar soils: 30 percent

Minor Components

Blacklake mucky peat: 0 to 5 percent

Tallcreek silt loam: 0 to 3 percent

Slopes greater than 2 percent: 0 to 2 percent

Major Component Description

Meadowpeak

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 10.1 inches

Firetower

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Rare
Water table: Apparent
Available water capacity: Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

732A—Meadowpeak silt loam, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Meadowpeak and similar soils: 90 percent

Minor Components

Bigbeaver, occasionally flooded: 0 to 5 percent

Blacklake muck: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Frequent
Water table: Apparent
Available water capacity: Mainly 10.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Millpocket Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 2 to 8 percent

Elevation: 2,800 to 3,200 feet

Annual precipitation: 17 to 19 inches

Frost-free period: 100 to 110 days

Taxonomic Class: Fine, mixed, active, frigid Typic Natrixeralfs

Typical Pedon

Millpocket silty clay loam, 2 to 8 percent slopes, in an area of forestland, 3,000 feet south and 1,950 feet west of the northeast corner of sec. 17, T. 23 N., R. 24 W.

Oi—1 inch to 0; undecomposed and partially decomposed forest litter.

E—0 to 7 inches; light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, firm, moderately sticky, slightly plastic; many fine and medium and few coarse roots; many fine pores; neutral; clear smooth boundary.

E/Bt—7 to 11 inches; E part (60 percent) is light gray (10YR 7/2) silty clay loam, grayish brown (10YR 5/2) moist; B part (40 percent) is very pale brown (10YR 7/4) silty clay, yellowish brown (10YR 5/4) moist; strong medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common fine and few coarse roots; many very fine and fine and common medium pores; common faint clay films on faces of peds; neutral; gradual smooth boundary.

Bt—11 to 20 inches; very pale brown (10YR 7/4) silty clay, yellowish brown (10YR 5/4) moist; strong medium angular blocky structure; hard, very firm, moderately sticky, very plastic; common fine and few coarse roots; many very fine and fine pores; many distinct clay films on faces of peds and in pores; neutral; gradual smooth boundary.

Btnk—20 to 28 inches; very pale brown (10YR 7/4) silty clay, light yellowish brown (10YR 6/4) moist; moderate medium angular and subangular blocky

structure; hard, firm, very sticky, moderately plastic; common fine and few coarse roots; common fine pores; few faint clay films on faces of peds; common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bnk—28 to 39 inches; very pale brown (10YR 7/4) silty clay, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; slightly hard, firm, very sticky, moderately plastic; few fine roots; few fine pores; common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—39 to 60 inches; very pale brown (10YR 8/3) silty clay, light yellowish brown (10YR 6/4) moist; massive; slightly hard, firm, very sticky, moderately plastic; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Btnk horizon: 15 to 30 inches

Notes: Some profiles lack an E/Bt horizon. The BC horizon may contain varved lake sediments.

E horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Clay content: 27 to 40 percent

Reaction: pH 6.6 to 7.3

E/Bt horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: E part: 2; B part: 3 or 4

Texture: E part: Silty clay loam; B part: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 0 to 1

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.8

Bt horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity (mmhos/cm): 0 to 1

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.8

Btnk and Bnk horizons

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 5 to 10 percent
 Electrical conductivity (mmhos/cm): 1 to 2
 Sodium adsorption ratio: 13 to 30
 Reaction: pH 7.9 to 9.0

BC horizon

Value: 6, 7, or 8 dry; 5 or 6 moist
 Chroma: 3 or 4
 Texture: Silty clay or silty clay loam
 Clay content: 30 to 50 percent
 Calcium carbonate equivalent: 0 to 5 percent
 Electrical conductivity (mmhos/cm): 0 to 2
 Sodium adsorption ratio: 4 to 20
 Reaction: pH 7.4 to 9.0

72B—Millpocket silty clay loam, 2 to 8 percent slopes

Setting

Landform: Lake plains or terraces
Slope: 2 to 8 percent
Elevation: 2,800 to 3,200 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 100 to 110 days

Composition

Major Components

Millpocket and similar soils: 85 percent

Minor Components

Wildgen gravelly loam: 0 to 5 percent
 Slopes greater than 8 percent: 0 to 5 percent
 Aeris Haplaquepts: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 8.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Minesinger Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans and stream terraces
Parent material: Tertiary sediments
Slope range: 2 to 50 percent
Elevation: 2,700 to 4,500 feet
Annual precipitation: 14 to 18 inches
Frost-free period: 100 to 125 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Typic Argixerolls

Typical Pedon

Minesinger gravelly loam, 4 to 15 percent slopes, in an area of rangeland, 1,000 feet north and 1,600 feet west of the southeast corner of sec. 9, T. 21 N., R. 22 W.

- A1—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky, nonplastic; many fine and few medium roots; 5 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.
- A2—6 to 13 inches; brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many fine roots; 10 percent cobbles and 20 percent pebbles; neutral; gradual smooth boundary.
- Bt—13 to 24 inches; light yellowish brown (10YR 6/4) very gravelly clay, dark yellowish brown (10YR 4/4) moist; strong fine and medium angular blocky structure; hard, firm, moderately sticky, very plastic; common fine roots; common distinct clay films on faces of peds; 15 percent cobbles and 30 percent pebbles; slightly effervescent; slightly alkaline; gradual smooth boundary.
- Bk—24 to 60 inches; very pale brown (10YR 7/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; weak medium angular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; few fine roots; few faint clay films on faces of peds; 15 percent cobbles and 30 percent pebbles; many fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 43 to 47 degrees F*Moisture control section:* Between 4 and 12 inches*Thickness of the mollic epipedon:* 7 to 16 inches*Depth to the Bk horizon:* 24 to 50 inches**A1 horizon**

Hue: 10YR or 7.5YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Clay content: 18 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to
5 percent stones; 5 to 10 percent cobbles;
10 to 20 percent pebbles

Reaction: pH 6.6 to 7.3

A2 horizon

Hue: 10YR or 7.5YR

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 25 to 50 percent—0 to
15 percent stones; 5 to 15 percent cobbles;
20 to 30 percent pebbles

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Clay or clay loam

Clay content: 35 to 50 percent

Content of rock fragments: 35 to 55 percent—0 to
10 percent stones; 10 to 15 percent cobbles;
25 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Clay loam or clay

Clay content: 27 to 40 percent

Content of rock fragments: 35 to 55 percent—0 to
10 percent stones; 10 to 15 percent cobbles;
25 to 30 percent pebbles

Calcium carbonate equivalent: 3 to 8 percent

Reaction: pH 7.4 to 8.4

**57D—Minesinger gravelly loam,
4 to 15 percent slopes****Setting***Landform:* Alluvial fans and stream terraces*Position on landform:* Treads*Slope:* 4 to 15 percent*Elevation:* 2,700 to 3,500 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Minesinger and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Bowlake gravelly loam: 0 to 5 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Tertiary age sediments*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**57E—Minesinger stony loam,
15 to 30 percent slopes****Setting***Landform:* Alluvial fans and stream terraces*Position on landform:* Dissected or incised treads*Slope:* 15 to 30 percent*Elevation:* 2,700 to 3,500 feet*Mean annual precipitation:* 15 to 17 inches*Frost-free period:* 105 to 125 days

Composition

Major Components

Minesinger and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bowlake gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

59D—Minesinger stony loam, cool, 4 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,800 to 4,500 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Minesinger and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent

Bowlake gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

59E—Minesinger stony loam, cool, 15 to 30 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Position on landform: Dissected or incised treads

Slope: 15 to 30 percent

Elevation: 2,800 to 4,500 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Minesinger and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bowlake gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

59F—Minesinger stony loam, cool, 30 to 50 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Position on landform: Dissected or incised treads

Slope: 30 to 50 percent

Elevation: 2,800 to 4,500 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Minesinger and similar soils: 85 percent

Minor Components

Slopes greater than 50 percent: 0 to 8 percent

Areas of rock outcrop: 0 to 5 percent

Bowlake gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Tertiary age sediments

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Mitten Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Volcanic ash over colluvium

Slope range: 8 to 70 percent

Elevation: 2,200 to 5,500 feet

Annual precipitation: 24 to 36 inches

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Eutrudepts

Typical Pedon

Mitten gravelly silt loam, 35 to 60 percent slopes, in an area of forestland, 2,000 feet north and 200 feet east of the southwest corner of sec. 17, T. 21 N., R. 24 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

Bw—0 to 7 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 25 percent pebbles; slightly acid; clear smooth boundary.

2E—7 to 21 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium roots; 10 percent cobbles and 45 percent pebbles; slightly acid; gradual wavy boundary.

2E/Bw—21 to 60 inches; E part (75 percent) is pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 4/3) moist; B part (25 percent) is yellowish brown (10YR 5/4) extremely gravelly loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few very fine and fine roots; 15 percent cobbles and 55 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 41 to 46 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 10 inches

Bw horizon

Value: 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 10 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Moist bulk density: 0.95 g/cm³ or less

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: More than 1 percent

Reaction: pH 5.6 to 6.5

2E horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

2E/Bw horizon

Hue: 7.5YR or 10YR

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Texture: Loam or sandy loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 80 percent—
10 to 20 percent cobbles; 50 to 60 percent
pebbles

Reaction: pH 5.6 to 6.5

32E—Mitten gravelly silt loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,200 to 5,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 85 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Holloway gravelly silt loam: 0 to 5 percent

Tevis gravelly loam, dry: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over
colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

32F—Mitten gravelly silt loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,200 to 5,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 85 percent

Minor Components

Holloway gravelly silt loam: 0 to 4 percent

Tevis gravelly loam, dry: 0 to 4 percent

Slopes greater than 60 percent: 0 to 4 percent

Areas of rubble land: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over
colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

32G—Mitten-Rubble land complex, 40 to 70 percent slopes

Setting

Landform: Mountains

Slope: 40 to 70 percent

Elevation: 4,200 to 5,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 55 percent

Rubble land: 30 percent

Minor Components

Areas of rock outcrop: 0 to 9 percent

Holloway gravelly silt loam: 0 to 6 percent

Major Component Description

Mitten

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

33E—Mitten gravelly silt loam, dry, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,900 to 5,500 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Tevis gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

33F—Mitten gravelly silt loam, dry, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,900 to 5,500 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 85 percent

Minor Components

Tevis gravelly loam, dry: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

132F—Mitten-Tevis complex, 35 to 60 percent slopes

Setting

Landform:

- Mitten—Mountains

- Tevis—Mountains

Slope:

- Mitten—35 to 60 percent

- Tevis—35 to 60 percent

Elevation: 4,200 to 5,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 50 percent
Tevis and similar soils: 35 percent

Minor Components

Areas of rubble land: 0 to 5 percent
Holloway gravelly silt loam: 0 to 5 percent
Tevis gravelly loam, dry: 0 to 5 percent

Major Component Description

Mitten

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Tevis

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

374F—Mitten-Rock outcrop complex, 40 to 70 percent slopes

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 3,600 to 4,800 feet
Mean annual precipitation: 28 to 36 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mitten and similar soils: 60 percent
Rock outcrop: 30 percent

Minor Components

Sharrott gravelly loam, cool: 0 to 5 percent
Slopes less than 40 percent: 0 to 5 percent

Major Component Description

Mitten

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Mocmont Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from argillite and quartzite
Slope range: 8 to 35 percent
Elevation: 3,200 to 5,000 feet
Annual precipitation: 18 to 22 inches
Annual air temperature: 38 to 43 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Mocmont very gravelly loam, in an area of Mocmont-Winkler complex, 8 to 35 percent slopes, in an area of forestland, 1,300 feet south and 400 feet west of the northeast corner of sec. 18, T. 18 N., R. 23 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 14 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly

hard, friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 15 percent cobbles and 30 percent pebbles; slightly acid; gradual smooth boundary.

Bt/E—14 to 30 inches; B part (70 percent) is pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; E part (30 percent) is light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; common very fine, fine, medium, and coarse roots; few faint clay films on faces of peds; 15 percent cobbles and 35 percent pebbles; slightly acid; gradual smooth boundary.

Bt—30 to 46 inches; light yellowish brown (10YR 6/4) extremely cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; common distinct clay films on faces of peds; 30 percent cobbles and 45 percent pebbles; slightly acid; gradual smooth boundary.

C—46 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, slightly plastic; 30 percent cobbles and 45 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Note: Some pedons have a thin A horizon.

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—5 to 20 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 6.5

Bt/E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent—10 to 15 percent cobbles; 25 to 45 percent pebbles

Reaction: pH 6.1 to 6.5

Bt horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent

Content of rock fragments: 60 to 85 percent—20 to 30 percent cobbles; 40 to 55 percent pebbles

Reaction: pH 6.1 to 6.5

C horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 10 to 25 percent

Content of rock fragments: 60 to 90 percent—25 to 40 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

123E—Mocmont-Winkler complex, 8 to 35 percent slopes

Setting

Landform:

- Mocmont—Mountains
- Winkler—Mountains

Slope:

- Mocmont—8 to 35 percent
- Winkler—8 to 35 percent

Elevation: 3,200 to 5,000 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mocmont and similar soils: 50 percent

Winkler and similar soils: 35 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Mocmont

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.9 inches

Winkler

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Moiese Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid to the 2Bk horizon; rapid below this depth

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
Calcic Haploxerolls

Typical Pedon

Moiese gravelly loam, 0 to 4 percent slopes, in an area of pasture, 3,200 feet north and 1,250 feet east of the southwest corner of sec. 13, T. 20 N., R. 22 W.

A—0 to 7 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; 20 percent pebbles; slightly acid; abrupt smooth boundary.

Bw1—7 to 11 inches; grayish brown (10YR 5/2) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 40 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw2—11 to 16 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, friable, nonsticky, nonplastic; few fine roots; 5 percent cobbles and 45 percent pebbles; few

faint coats of lime on undersides of fragments; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bk—16 to 60 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few fine roots; 20 percent cobbles and 55 percent pebbles; common prominent coats of lime on undersides of fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 45 to 47 degrees F

Moisture control section: Between 12 and 35 inches

Thickness of the mollic epipedon: 7 to 16 inches

Depth to the 2Bk horizon: 12 to 19 inches

A horizon

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

Bw horizons

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles

Calcium carbonate equivalent: 0 to 1 percent

Reaction: pH 6.6 to 7.8

2Bk horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 0 to 5 percent

Content of rock fragments: 50 to 75 percent—0 to 20 percent cobbles; 50 to 55 percent pebbles

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.4 to 8.4

2B—Moiese gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Moiese and similar soils: 90 percent

Minor Components

Moiese gravelly loam, stony: 0 to 4 percent

Slopes greater than 4 percent: 0 to 4 percent

Grantsdale silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Mollman Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines, glacial trough walls, and mountains

Parent material: Alpine till or glacial drift

Slope range: 2 to 60 percent

Elevation range: 3,400 to 4,200 feet

Annual precipitation: 24 to 34 inches

Annual air temperature: 40 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Eutrudepts

Typical Pedon

Mollman gravelly loam, 30 to 50 percent slopes, in an area of forestland, 1,200 feet north and 500 feet west of the southeast corner of sec. 24, T. 25 N., R. 27 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

E—0 to 10 inches; grayish brown (10YR 5/2) gravelly loam, light gray (10YR 7/2) dry; weak fine and medium subangular blocky structure; soft, very

friable, slightly sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; 5 percent cobbles and 20 percent pebbles; neutral; gradual wavy boundary.

E/Bw—10 to 20 inches; E part (60 percent) grayish brown (10YR 5/2) very gravelly loam, light gray (10YR 7/2) dry; B part (40 percent) brown (10YR 5/3) very gravelly loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; 10 percent cobbles and 25 percent pebbles; neutral; abrupt wavy boundary.

Bk1—20 to 24 inches; brown (10YR 5/3) very gravelly loam, very pale brown (10YR 7/3) dry; weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; 10 percent cobbles and 30 percent pebbles; disseminated lime; many distinct lime coatings on undersides of fragments; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 41 inches; brown (7.5YR 5/2) very gravelly loam, pinkish gray (7.5YR 7/2) dry; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 10 percent cobbles and 35 percent pebbles; disseminated lime; many distinct lime coatings on undersides of fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—41 to 60 inches; pinkish gray (7.5YR 6/2) very gravelly loam, pinkish white (7.5YR 8/2) dry; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 10 percent cobbles and 50 percent pebbles; disseminated lime; many distinct lime coatings on undersides of fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 20 to 40 inches

E horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles
Reaction: pH 6.1 to 7.3

E/Bw horizon

Hue: E part: 10YR or 2.5Y; B part: 10YR or 7.5YR
Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist
Chroma: E part: 2, 3, or 4; B part: 3, 4, 6, or 8
Texture: Loam or silt loam
Clay content: 10 to 27 percent
Content of rock fragments: 35 to 60 percent—10 to 20 percent cobbles; 25 to 40 percent pebbles
Reaction: pH 6.1 to 7.3

Bk horizons

Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Loam or silt loam
Clay content: 15 to 27 percent
Content of rock fragments: 35 to 60 percent—10 to 20 percent cobbles; 25 to 40 percent pebbles
Calcium carbonate equivalent: 15 to 35 percent
Reaction: pH 7.9 to 8.4

**97F—Mollman gravelly loam,
30 to 50 percent slopes**

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mollman and similar soils: 90 percent

Minor Components

Mollman gravelly loam, dry: 0 to 5 percent
Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**897C—Mollman gravelly loam,
2 to 8 percent slopes**

Setting

Landform: Moraines
Slope: 2 to 8 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mollman and similar soils: 90 percent

Minor Components

Ashworth gravelly silt loam: 0 to 5 percent
Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**897E—Mollman gravelly loam,
8 to 30 percent slopes**

Setting

Landform: Moraines
Slope: 8 to 30 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Mollman and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bendahl gravelly silt loam: 0 to 3 percent

Mollman gravelly loam, dry: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

971E—Mollman gravelly loam, dry, 15 to 30 percent slopes

Setting

Landform: Moraines

Slope: 15 to 30 percent

Elevation: 3,400 to 4,200 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mollman and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bendahl gravelly silt loam: 0 to 3 percent

Lesier gravelly silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

971F—Mollman gravelly loam, dry, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 3,400 to 4,200 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Mollman and similar soils: 90 percent

Minor Components

Mollman gravelly loam: 0 to 5 percent

Mitten gravelly silt loam: 0 to 4 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Murrstead Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Organic materials and alluvium

Slope range: 0 to 2 percent

Elevation range: 3,200 to 3,800 feet

Annual precipitation: 24 to 30 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Euic, frigid Fluvaquentic
Haplohemists

Typical Pedon

Murrstead mucky peat, 0 to 2 percent slopes, in an area of wet meadow hayland, 500 feet south and 950 feet west of the northeast corner of sec. 8, T. 25 N., R. 26 W.

Oe1—0 to 8 inches; black (10YR 2/1) broken face and rubbed mucky peat (hemic material); 60 percent fiber and raw herbaceous plant material—30 percent rubbed; weak very fine granular structure; nonsticky nonplastic; herbaceous fiber, mostly residue from *Phragmites arundinacea*; many very fine and fine roots; slightly acid; clear smooth boundary.

Oe2—8 to 12 inches; very dark gray (10YR 3/1) broken face mucky peat (hemic material); very dark brown (10YR 2/2) rubbed and pressed; 50 percent fiber—20 percent rubbed; strong thick platy structure parting to weak thin platy; nonsticky nonplastic; herbaceous fiber; many very fine and fine roots; slightly acid; clear smooth boundary.

Oe/C—12 to 21 inches; stratified ($\frac{1}{4}$ to $\frac{3}{4}$ inch) black (10YR 2/1) broken face and rubbed mucky peat (hemic material) (50 percent), 50 percent fiber—20 percent rubbed; and very dark brown (10YR 3/2) mucky silt loam (40 percent), and dark gray (10YR 4/1) silt loam (10 percent); weak thin platy structure parting to weak fine granular; slightly hard, friable, nonsticky, nonplastic; common very fine and fine roots; slightly acid; abrupt wavy boundary.

Oe3—21 to 46 inches; stratified ($\frac{1}{4}$ to $\frac{3}{4}$ inch) black (10YR 2/1) and very dark gray (10YR 3/1) broken face mucky peat (stratified hemic (80 percent) and fibric (20 percent) material); black (10YR 2/1) rubbed and pressed, 40 percent fiber—20 percent rubbed; massive; nonsticky nonplastic; herbaceous fiber, mostly leaves of *Alnus tenuifolia*; common very fine and fine roots; moderately acid; abrupt smooth boundary.

Cg—46 to 54 inches; stratified ($\frac{1}{4}$ to $\frac{1}{2}$ inch) light gray (5Y 6/1) silt and very fine sandy loam; massive; soft, very friable, nonsticky, nonplastic;

few fine roots; moderately acid; abrupt wavy boundary.

Oe'—54 to 60 inches; stratified ($\frac{1}{4}$ to 1 inch) black (10YR 2/1) and very dark brown (10YR 2/2) broken face mucky peat (hemic (70 percent) and sapric (30 percent) material) and black (10YR 2/1) rubbed and pressed, 40 percent fiber—20 percent rubbed; thin strata of very dark gray (10YR 3/1) silt loam; massive; nonsticky nonplastic; herbaceous fiber; few fine roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Thickness of organic material: Greater than 52 inches

Depth to the seasonal high water table: Surface to 12 inches

Depth to the Cg horizon: 38 to 50 inches

Notes: The combined thickness of the Oe1 and Oe2 horizons is 12 to 23 inches. C/Oe or thin C horizons are present in some pedons. An Oa horizon is present in some pedons.

Oe1 and Oe2 horizons

Value: 2 or 3

Chroma: 1 or 2

Fiber content, unrubbed: 40 to 60 percent

Fiber content, rubbed: 20 to 30 percent

Reaction: pH 5.6 to 6.5

Oe/C horizon

Value: Oe part: 2 or 3; C part: 2, 3, or 4

Chroma: 1 or 2

Fiber content, unrubbed, Oe part: 40 to 60 percent

Fiber content, rubbed, Oe part: 20 to 30 percent

Texture: C part: Silt loam and mucky silt loam

Clay content: C part: 5 to 15 percent

Reaction: pH 5.6 to 6.5

Oe3 horizon

Value: 2 or 3

Chroma: 1 or 2

Fiber content, unrubbed: 40 to 60 percent

Fiber content, rubbed: 20 to 30 percent

Reaction: pH 5.6 to 6.5

Cg horizon

Hue: 5Y, 5GY, 5G, or N

Value: 5 or 6

Chroma: 0, 1, or 2

Texture: Stratified silt loam, silt, or very fine sandy loam; averaging less than 15 percent fine sand or coarser

Clay content: 4 to 12 percent

Reaction: pH 5.6 to 6.5

Oe' horizon

Value: 2 or 3

Fiber content, unrubbed: 40 to 60 percent

Fiber content, rubbed: 20 to 30 percent

Reaction: pH 5.6 to 6.5

Annual precipitation: 15 to 18 inches*Frost-free period:* 90 to 110 days**Taxonomic Class:** Loamy-skeletal, mixed, superactive, frigid Calcic Haploxerolls**Typical Pedon**

Niarada gravelly loam, 4 to 15 percent slopes, in an area of rangeland, 2,250 feet north and 2,040 feet west of the southeast corner of sec. 18, T. 20 N., R. 21 W.

A1—0 to 8 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; 20 percent pebbles; neutral; clear smooth boundary.

A2—8 to 13 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine roots; 15 percent cobbles and 25 percent pebbles; neutral; clear smooth boundary.

Bw—13 to 26 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 15 percent cobbles and 30 percent pebbles; slightly alkaline; clear smooth boundary.

Bk1—26 to 29 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few fine roots; 20 percent cobbles and 25 percent pebbles; common fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—29 to 60 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; 15 percent cobbles and 40 percent pebbles; many fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics*Soil temperature:* 43 to 47 inches*Moisture control section:* Between 4 and 12 inches*Thickness of the mollic epipedon:* 7 to 20 inches*Depth to the Bk horizon:* 18 to 30 inches*A horizons*

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

6A—Murrstead mucky peat, 0 to 2 percent slopes**Setting***Landform:* Flood plains*Slope:* 0 to 2 percent*Elevation:* 3,200 to 3,800 feet*Mean annual precipitation:* 24 to 30 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Murrstead and similar soils: 90 percent

Minor Components

McLangor mucky peat: 0 to 7 percent

Meadowpeak, occasionally flooded: 0 to 3 percent

Major Component Description*Surface layer texture:* Mucky-peat*Depth class:* Very deep (more than 60 inches)*Drainage class:* Very poorly drained*Dominant parent material:* Organic deposits*Native plant cover type:* Rangeland*Flooding:* Frequent*Water table:* Apparent*Available water capacity:* Mainly 18.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Niarada Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Hills*Parent material:* Calcareous alluvium, colluvium, or glacial drift*Slope range:* 4 to 60 percent*Elevation:* 2,600 to 4,900 feet

Content of rock fragments: 15 to 50 percent—0 to 15 percent cobbles; 15 to 35 percent pebbles
Reaction: pH 6.6 to 7.8

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 60 percent—10 to 15 percent cobbles; 25 to 45 percent pebbles
Reaction: pH 6.6 to 7.8

Bk horizons

Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sandy loam or loam
Clay content: 10 to 18 percent
Content of rock fragments: 35 to 60 percent—10 to 20 percent cobbles; 25 to 40 percent pebbles
Calcium carbonate equivalent: 15 to 25 percent
Reaction: pH 7.9 to 8.4

**55D—Niarada gravelly loam,
4 to 15 percent slopes**

Setting

Landform: Hills
Slope: 4 to 15 percent
Elevation: 2,600 to 4,200 feet
Mean annual precipitation: 15 to 17 inches
Frost-free period: 100 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 5 percent
Niarada stony loam: 0 to 5 percent
Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**55E—Niarada gravelly loam,
15 to 30 percent slopes**

Setting

Landform: Hills
Slope: 15 to 30 percent
Elevation: 2,600 to 4,200 feet
Mean annual precipitation: 15 to 17 inches
Frost-free period: 100 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Minesinger gravelly loam: 0 to 5 percent
Niarada stony loam: 0 to 5 percent
Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or glacial drift
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**55F—Niarada gravelly loam,
30 to 60 percent slopes**

Setting

Landform: Hills
Slope: 30 to 60 percent

Elevation: 2,600 to 4,200 feet

Mean annual precipitation: 15 to 17 inches

Frost-free period: 100 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Niarada stony loam: 0 to 9 percent

Minesinger gravelly loam: 0 to 6 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or glacial drift

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60D—Niarada gravelly loam, cool, 4 to 15 percent slopes

Setting

Landform: Hills

Slope: 4 to 15 percent

Elevation: 3,000 to 4,900 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Niarada gravelly loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Finleypoint gravelly loam, dry: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or glacial drift

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60E—Niarada gravelly loam, cool, 15 to 30 percent slopes

Setting

Landform: Hills

Slope: 15 to 30 percent

Elevation: 3,000 to 4,900 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Niarada gravelly loam: 0 to 4 percent

Finleypoint gravelly loam, dry: 0 to 4 percent

Slopes greater than 30 percent: 0 to 4 percent

Areas of rock outcrop: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or glacial drift

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

60F—Niarada gravelly loam, cool, 30 to 60 percent slopes

Setting

Landform: Hills

Slope: 30 to 60 percent

Elevation: 3,000 to 4,900 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Niarada and similar soils: 85 percent

Minor Components

Finleypoint gravelly loam, dry: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or glacial drift

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Noxlin Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Volcanic ash over alluvium and glacial outwash

Slope range: 4 to 35 percent

Elevation range: 2,200 to 2,700 feet

Annual precipitation: 28 to 32 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Andic Paleudalfs

Typical Pedon

Noxlin silt loam, in an area of Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony, in an area of forestland, 2,000 feet south and 2,100 feet east of the northwest corner of sec. 34, T. 24 N., R. 31 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine, common fine and medium, and few coarse roots; slightly acid; clear wavy boundary.

Bw—1 to 10 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; 5 percent pebbles; slightly acid; clear wavy boundary.

2E—10 to 26 inches; light brownish gray (10YR 6/2) very gravelly loam, white (10YR 8/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; 10 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

2E/Bt—26 to 38 inches; E part (70 percent) is light brownish gray (10YR 6/2) very gravelly loam, white (10YR 8/2) dry; B part (30 percent) is brown (7.5YR 5/4) very gravelly loam, pink (7.5YR 7/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and coarse roots; common distinct clay films on faces of peds; 5 percent cobbles and 45 percent pebbles; neutral; gradual wavy boundary.

2Bt/E—38 to 60 inches; B part (70 percent) is brown (7.5YR 5/4) very gravelly loam, pink (7.5YR 7/4) dry; E part (30 percent) is light brownish gray (10YR 6/2) very gravelly loam, white (10YR 8/2) dry; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; few coarse roots; many distinct clay films on faces of peds; 10 percent cobbles and 45 percent pebbles; neutral.

Range in Characteristics*Soil temperature:* 44 to 47 degrees F*Moisture control section:* Between 8 and 24 inches**A horizon**

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 5 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 5 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.6 to 6.5

2E horizon

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 55 percent—5 to 15 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

2E/Bt horizon

Hue: E part: 10YR; B part: 10YR or 7.5YR

Value: E part: 6, 7, or 8 dry, 5, 6, or 7 moist;

B part: 5, 6, or 7 dry, 4, 5, or 6 moist

Clay content: E part: 8 to 18 percent; B part: 18 to 27 percent

Content of rock fragments: 40 to 60 percent—5 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

2Bt/E horizon

Hue: B part: 10YR or 7.5YR; E part: 10YR

Value: B part: 5, 6, or 7 dry, 4, 5, or 6 moist;

E part: 6, 7, or 8 dry, 5, 6, or 7 moist

Clay content: B part: 18 to 27 percent; E part: 8 to 18 percent

Content of rock fragments: 40 to 60 percent—5 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 5.6 to 7.3

81E—Noxlin silt loam, 8 to 35 percent slopes, stony**Setting***Landform:* Stream terraces*Position on landform:* Dissected or incised tread*Slope:* 8 to 35 percent*Elevation:* 2,200 to 2,700 feet*Mean annual precipitation:* 28 to 32 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Noxlin and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Fernline silt loam: 0 to 5 percent

Major Component Description*Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over alluvium or outwash*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 6.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

811D—Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony**Setting***Landform:*

- Noxlin—Stream terraces
- Fernline—Lake plains or terraces

Position on landform:

- Noxlin—Dissected or incised treads
- Fernline—Dissected or incised treads

Slope:

- Noxlin—4 to 15 percent
- Fernline—4 to 15 percent

Elevation: 2,200 to 2,700 feet*Mean annual precipitation:* 28 to 32 inches*Frost-free period:* 90 to 105 days**Composition****Major Components**

Noxlin and similar soils: 55 percent

Fernline and similar soils: 30 percent

Minor Components

Dewberry gravelly silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Noxlin silt loam, bouldery: 0 to 3 percent

Stargulch very fine sandy loam: 0 to 2 percent

Major Component Description**Noxlin***Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over alluvium or outwash*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 6.7 inches**Fernline***Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over glaciolacustrine*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Oldtrail Series*Depth class:* Very deep*Drainage class:* Moderately well drained*Permeability:* Rapid*Landform:* Flood plains and drainageways*Parent material:* Alluvium*Slope range:* 0 to 8 percent*Elevation range:* 2,200 to 4,200 feet*Annual precipitation:* 20 to 34 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 70 to 105 days

Taxonomic Class: Sandy-skeletal, mixed, frigid
Oxyaquic Udifluvents

Typical Pedon

Oldtrail gravelly sandy loam, 0 to 8 percent slopes, in an area of forestland, 100 feet north and 100 feet west of the center of sec. 33, T. 26 N., R. 33 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; slightly hard, friable, nonsticky, nonplastic; many very fine and common fine roots; 5 percent cobbles and 30 percent pebbles; moderately acid; clear wavy boundary.

C1—4 to 12 inches; dark grayish brown (10YR 4/2) extremely gravelly loamy coarse sand, light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky, nonplastic; common fine and very fine roots; 20 percent cobbles and 50 percent pebbles; moderately acid; abrupt wavy boundary.

C2—12 to 25 inches; dark grayish brown (10YR 4/2) extremely cobbly loamy coarse sand, with thin strata of sand; light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky, nonplastic; few very fine roots; 40 percent cobbles and 30 percent pebbles; moderately acid; gradual wavy boundary.

C3—25 to 60 inches; stratified dark grayish brown (10YR 4/2) extremely cobbly loamy coarse sand, light brownish gray (10YR 6/2) dry, and very dark grayish brown (10YR 3/2) extremely gravelly loamy coarse sand, grayish brown (10YR 5/2) dry; single grain; loose, nonsticky, nonplastic; few very fine roots; 40 percent cobbles and 30 percent pebbles; moderately acid.

Range in Characteristics*Soil temperature:* 42 to 45 degrees F*Moisture control section:* Between 12 and 35 inches

Depth to the seasonal high water table: 24 to 42 inches

A horizon

Value: 3 or 4 moist; 5 or 6 dry

Chroma: 2 or 3

Clay content: 0 to 10 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 5.6 to 6.5

C1 horizon

Value: 4 or 5 moist; 6 or 7 dry
Chroma: 2 or 3
Texture: Loamy coarse sand or coarse sandy loam
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 80 percent—10 to 20 percent cobbles; 50 to 60 percent pebbles
Reaction: pH 5.6 to 6.5

C2 and C3 horizons

Value: 3, 4, or 5 moist; 5, 6, or 7 dry
Chroma: 2 or 3
Texture: Loamy coarse sand, coarse sand, or loamy sand
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 80 percent—(30 to 40 percent cobbles; 30 to 40 percent pebbles)
Reaction: pH 5.6 to 6.5

41B—Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes

Setting

Landform:

- Oldtrail—Flood plains
- Glaciercreek—Stream terraces and outwash plains
- Larchpoint—Flood plains

Slope:

- Oldtrail—0 to 8 percent
- Glaciercreek—2 to 8 percent
- Larchpoint—0 to 2 percent

Elevation: 3,100 to 4,200 feet

Mean annual precipitation: 20 to 28 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Oldtrail and similar soils: 40 percent
Glaciercreek and similar soils: 25 percent
Larchpoint and similar soils: 20 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent
Slopes greater than 4 percent: 0 to 5 percent
Larchpoint silt loam: 0 to 5 percent

Major Component Description

Oldtrail

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 2.2 inches

Glaciercreek

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Volcanic ash over alluvium or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.7 inches

Larchpoint

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

92C—Oldtrail gravelly sandy loam, 0 to 8 percent slopes

Setting

Landform: Drainageways

Slope: 0 to 8 percent

Elevation: 2,200 to 3,400 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Oldtrail and similar soils: 90 percent

Minor Components

Ibex silt loam: 0 to 4 percent

Oldtrail cobbly sandy loam: 0 to 4 percent

Areas of riverwash: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 2.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Pashua Series

Depth class: Moderately deep

Drainage class: Well drained

Permeability: Slow

Landform: Mountains

Parent material: Colluvium and residuum derived from semiconsolidated welded tuff

Slope range: 8 to 30 percent

Elevation: 3,200 to 3,800 feet

Annual precipitation: 20 to 24 inches

Annual air temperature: 39 to 42 degrees F

Frost-free period: 80 to 100 days

Taxonomic Class: Fine, mixed, active, frigid Typic Haplustalfs

Typical Pedon

Pashua gravelly loam, 8 to 30 percent slopes, in an area of forestland, 1,050 feet north and 500 feet west of the southeast corner of sec. 34. T. 25 N., R. 24 W.

A—0 to 8 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine, fine, and medium and few coarse roots; few fine tubular pores; 20 percent pebbles; slightly acid; clear smooth boundary.

E—8 to 14 inches; very pale brown (10YR 7/3) gravelly silt loam, light yellowish brown (10YR

6/4) moist; moderate medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; few very fine, common fine and medium, and few coarse roots; many very fine and common fine tubular pores; 5 percent cobbles, 15 percent pebbles, and 15 percent soft fragments; neutral; clear smooth boundary.

Bt/E—14 to 19 inches; B part (70 percent) is brownish yellow (10YR 6/6) gravelly clay, yellowish brown (10YR 5/6) moist; E part (30 percent) is very pale brown (10YR 8/4) sandy clay, light yellowish brown (10YR 6/4) moist; moderate medium and coarse angular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; few very fine, fine, and coarse roots; many very fine and fine tubular pores; few distinct clay films on faces of peds and in pores; 5 percent cobbles, 20 percent pebbles, and 5 percent soft fragments; neutral; clear smooth boundary.

Bt1—19 to 25 inches; yellow (10YR 7/6) clay, yellowish brown (10YR 5/6) moist; strong medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; few fine and coarse roots; many very fine and fine tubular pores; common distinct clay films on faces of peds and in pores; 10 percent pebbles and 15 percent soft fragments; neutral; gradual smooth boundary.

Bt2—25 to 37 inches; yellow (10YR 7/6) gravelly clay loam, brownish yellow (10YR 6/6) moist; moderate medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; few very fine, fine, and coarse roots; many very fine and fine tubular pores; few distinct clay films on faces of peds and in pores; 10 percent cobbles, 15 percent pebbles, and 25 percent soft fragments; neutral; clear smooth boundary.

Cr—37 to 60 inches; semiconsolidated welded tuff.

Range in Characteristics

Soil temperature: 41 to 44 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Cr horizon: 20 to 40 inches

Note: When mixed to 7 inches, the surface layer fails to meet the requirements of a mollic epipedon.

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3 or 4

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.1 to 6.5

E horizon

Value: 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 3 or 4
 Texture: Loam or silt loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 15 to 50 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles; 0 to 15 percent soft fragments
 Reaction: pH 6.1 to 7.3

Bt/E horizon

Hue: 10YR or 2.5Y
 Value: Bt part: 6 or 7 dry, 4, 5, or 6 moist; E part: 6, 7, or 8 dry, 5 or 6 moist
 Chroma: 3, 4, or 6
 Texture: Clay or sandy clay
 Clay content: 35 to 50 percent
 Content of rock fragments: 10 to 50 percent—0 to 10 percent cobbles; 5 to 30 percent pebbles; 5 to 10 percent soft fragments
 Reaction: pH 6.1 to 7.3

Bt1 horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 4 or 6
 Texture: Clay or sandy clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 10 to 45 percent—0 to 5 percent cobbles; 5 to 20 percent pebbles; 5 to 20 percent soft fragments
 Reaction: pH 6.1 to 7.3

Bt2 horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 3, 4, or 6
 Texture: Clay or clay loam
 Clay content: 27 to 50 percent
 Content of rock fragments: 20 to 60 percent—0 to 10 percent cobbles; 5 to 20 percent pebbles; 15 to 30 percent soft fragments
 Reaction: pH 6.1 to 7.3

87E—Pashua gravelly loam, 8 to 30 percent slopes

Setting

Landform: Mountains
Slope: 8 to 30 percent
Elevation: 3,200 to 3,800 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 80 to 100 days

Composition

Major Components

Pashua and similar soils: 90 percent

Minor Components

Lozeau gravelly loam: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Tuff residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Petty Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid
Landform: Mountains
Parent material: Volcanic ash over colluvium derived from granite and gneiss
Slope range: 8 to 70 percent
Elevation: 5,000 to 6,500 feet
Annual precipitation: 36 to 45 inches
Annual air temperature: 37 to 42 degrees F
Frost-free period: 40 to 50 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Eutrocrypts

Typical Pedon

Petty gravelly loam, 8 to 30 percent slopes, in an area of forestland, 100 feet south and 200 feet east of the northwest corner of sec. 19, T. 18 N., R. 23 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

Bw—0 to 12 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine,

fine, and medium and common coarse roots;
5 percent cobbles and 25 percent pebbles;
slightly acid; clear smooth boundary.

2E/Bw—12 to 28 inches; E part (60 percent) is very pale brown (10YR 7/3) very gravelly coarse sandy loam, brown (10YR 5/3) moist; B part (40 percent) is pale brown (10YR 6/3) very gravelly coarse sandy loam, brown (10YR 5/3) moist; weak coarse subangular block structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 10 percent cobbles and 30 percent pebbles; moderately acid; clear wavy boundary.

2C—28 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly loamy sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; 40 percent cobbles and 30 percent pebbles; moderately acid; clear smooth boundary.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: 8 to 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 14 inches

Bw horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 4 or 6

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles

Moist bulk density: Less than 0.95 g/cm³

Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 3, 4, or 6

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 60 percent—5 to 15 percent stones and cobbles; 30 to 45 percent pebbles

Reaction: pH 5.6 to 6.5

2C horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3, 4, or 6

Clay content: 5 to 15 percent

Content of rock fragments: 45 to 70 percent—5 to 40 percent stones and cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 6.5

47E—Petty gravelly loam, 8 to 30 percent slopes

Setting

Landform: Mountains

Slope: 8 to 30 percent

Elevation: 5,000 to 6,500 feet

Mean annual precipitation: 36 to 45 inches

Frost-free period: 40 to 50 days

Composition

Major Components

Petty and similar soils: 85 percent

Minor Components

Slopes greater than 30 percent: 0 to 8 percent

Petty stony loam: 0 to 5 percent

Selway gravelly sandy loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

47F—Petty gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 5,000 to 6,500 feet

Mean annual precipitation: 36 to 45 inches

Frost-free period: 40 to 50 days

Composition

Major Components

Petty and similar soils: 85 percent

Minor Components

Areas of rubble land: 0 to 7 percent

Petty stony loam: 0 to 6 percent

Selway gravelly sandy loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**47G—Petty-Rubble land complex,
40 to 70 percent slopes****Setting**

Landform: Mountains

Slope: 40 to 70 percent

Elevation: 5,000 to 6,500 feet

Mean annual precipitation: 36 to 45 inches

Frost-free period: 40 to 50 days

Composition**Major Components**

Petty and similar soils: 60 percent

Rubble land: 25 percent

Minor Components

Areas of rock outcrop: 0 to 7 percent

Petty stony loam, bouldery: 0 to 5 percent

Petty stony loam: 0 to 2 percent

Selway gravelly sandy loam: 0 to 1 percent

Major Component Description**Petty**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Phillcher Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains and cirque basins

Parent material: Volcanic ash over glacial till or drift

Slope range: 8 to 70 percent

Elevation: 6,800 to 8,000 feet

Annual precipitation: 50 to 70 inches

Annual air temperature: 33 to 36 degrees F

Frost-free period: 20 to 40 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Eutrocryepts

Typical Pedon

Phillcher gravelly silt loam (mixed), 8 to 30 percent slopes, in an area of forestland, 750 feet north and 2,000 feet east of the southwest corner of sec. 11, T. 16 N., R. 22 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 2 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; moderately acid; clear wavy boundary.

Bw1—2 to 14 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, medium, and coarse roots; 30 percent pebbles; moderately acid; gradual wavy boundary.

2Bw2—14 to 26 inches; very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common very fine, fine, and medium roots; 10 percent cobbles and 35 percent pebbles; moderately acid; gradual wavy boundary.

2Bw3—26 to 60 inches; very pale brown (10YR 7/4) very gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, friable, nonsticky, nonplastic; few very fine and fine roots; 10 percent cobbles and 50 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 35 to 38 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 14 inches

Note: The E horizon is not present in some pedons.

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 15 percent pebbles

Moist bulk density: 0.95 g/cm³ or less

Reaction: pH 5.6 to 6.0

Bw1 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3 or 4

Clay content: 5 to 10 percent

Content of rock fragments: 15 to 35 percent pebbles

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: Greater than 1 percent

Moist bulk density: 0.95 g/cm³ or less

Reaction: pH 5.6 to 6.0

2Bw horizons

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.0

45D—Phillcher gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Mountains

Slope: 8 to 30 percent

Elevation: 6,800 to 8,000 feet

Mean annual precipitation: 50 to 70 inches

Frost-free period: 20 to 40 days

Composition

Major Components

Phillcher and similar soils: 85 percent

Minor Components

Holloway, cool: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

45G—Phillcher-Rock outcrop complex, 40 to 70 percent slopes

Setting

Landform: Cirque basins

Slope: 50 to 70 percent

Elevation: 6,800 to 8,000 feet

Mean annual precipitation: 50 to 70 inches

Frost-free period: 20 to 40 days

Composition

Major Components

Phillcher and similar soils: 45 percent

Rock outcrop: 40 percent

Minor Components

Holloway, cool: 0 to 9 percent

Areas of rubble land: 0 to 6 percent

Major Component Description

Phillcher

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Redlock Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate to 38 inches; slow below this depth

Landform: Lake plains and terraces

Parent material: Volcanic ash over glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,200 to 2,800 feet

Annual precipitation: 28 to 34 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy over clayey, mixed, active, frigid Andic Hapludalfs

Typical Pedon

Redlock silt loam, in an area of Redlock-Fernline silt loams, 0 to 4 percent slopes, in an area of forestland, 50 feet north and 2,550 feet west of the southeast corner of sec. 29, T. 24 N., R. 31 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; moderately acid; clear wavy boundary.

Bw—1 to 12 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak, medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; slightly acid; clear wavy boundary.

2E—12 to 17 inches; brown (10YR 5/3) very fine sandy loam, very pale brown (10YR 7/3) dry; weak fine granular structure; slightly hard, very friable, nonsticky, nonplastic; many fine and medium and common coarse roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; slightly acid; gradual wavy boundary.

2E/Bt—17 to 22 inches; E part (80 percent) is grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; B part (20 percent) is brown (7.5YR 5/2) loam, pinkish gray (7.5YR 6/2) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky, nonplastic; many fine and medium and common coarse roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; few distinct clay films on faces of peds; moderately acid; clear wavy boundary.

2Bt/E—22 to 28 inches; B part (60 percent) is brown (7.5YR 5/2) loam, pinkish gray (7.5YR 6/2) dry; E part (40 percent) is grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky, nonplastic; few fine and common medium and coarse roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; few distinct clay films on faces of peds; slightly acid; clear wavy boundary.

3E and Bt—28 to 38 inches; E part (60 percent) is light brownish gray (10YR 6/2) loamy very fine sand, light gray (10YR 7/2) dry; weak fine granular structure; loose; nonsticky nonplastic; few fine and common medium and coarse roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; moderately acid; B part (40 percent) is brown (7.5YR 5/4) 1/2- to 2-inch thick very fine sandy

loam lamellae, light brown (7.5YR 6/4) dry; moderate medium platy structure; slightly hard, friable, slightly sticky, nonplastic; few fine and common medium and coarse roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; common distinct clay films on faces of peds; moderately acid; clear wavy boundary.

4Bt—38 to 44 inches; brown (7.5YR 5/4) clay, pinkish gray (7.5YR 7/2) dry; moderate coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few medium roots; few fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; many distinct clay films on faces of peds; slightly acid; gradual wavy boundary.

5E and Bt—44 to 54 inches; E part (60 percent) is light brownish gray (10YR 6/2) loamy very fine sand, light gray (10YR 7/2) dry; weak fine granular structure; loose, nonsticky, nonplastic; few medium roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; moderately acid; B part (40 percent) is brown (7.5YR 5/4) 1- to 3-inch thick very fine sandy loam lamellae, light brown (7.5YR 6/4) dry; moderate medium platy structure; slightly hard, friable, slightly sticky, nonplastic; few medium roots; common fine and medium yellowish brown (10YR 5/6) prominent iron stains on faces of peds; common distinct clay films on faces of peds; moderately acid; clear wavy boundary.

6Bt—54 to 60 inches; brown (7.5YR 5/4) clay, pinkish gray (7.5YR 7/2) dry; moderate coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many distinct clay films on faces of peds; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Clay content: 5 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Reaction: pH 5.1 to 6.5

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 5 to 15 percent

Moist bulk density: 0.85 to 1.0 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent

Reaction: pH 5.1 to 6.5

2E horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: 5 to 15 percent

Reaction: pH 5.1 to 6.5

2E/Bt horizon

Hue: E part: 10YR; B part: 7.5YR or 10YR

Value: E part: 5, 6, or 7 dry, 4, 5, or 6 moist;

B part: 4, 5, or 6 dry, 3, 4, or 5 moist

Clay content: E part: 8 to 12 percent; B part: 12 to 18 percent

Reaction: pH 5.1 to 6.5

2Bt/E horizon

Hue: B part: 7.5YR or 10YR; E part: 10YR

Value: B part: 4, 5, or 6 dry, 3, 4, or 5 moist;

E part: 5, 6, or 7 dry, 4, 5, or 6 moist

Clay content: B part: 12 to 18 percent; E part: 8 to 12 percent

Reaction: pH 5.1 to 6.5

3E and Bt horizon

Hue: E part: 10YR; B part: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: E part: 8 to 12 percent; B part: 12 to 18 percent

Reaction: pH 5.6 to 6.5

4Bt horizon

Hue: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: 40 to 60 percent

Reaction: pH 5.6 to 6.5

5E and Bt horizon

Hue: E part: 10YR; B part: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Clay content: E part: 8 to 12 percent; B part: 12 to 18 percent

Reaction: pH 5.6 to 6.5

6Bt horizon

Hue: 7.5YR or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 4, or 6

Clay content: 40 to 60 percent
Reaction: pH 5.6 to 6.5

791B—Redlock-Fernline silt loams, 0 to 4 percent slopes

Setting

Landform:

- Redlock—Lake plains or terraces
- Fernline—Lake plains or terraces

Position on landform:

- Redlock—Treads
- Fernline—Treads

Slope:

- Redlock—0 to 4 percent
- Fernline—0 to 4 percent

Elevation: 2,200 to 2,700 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Redlock and similar soils: 60 percent
Fernline and similar soils: 30 percent

Minor Components

Whitepine silt loam: 0 to 3 percent
Stargulch very fine sandy loam: 0 to 3 percent
Slopes greater than 4 percent: 0 to 3 percent
Iffgulch and similar soils: 0 to 1 percent

Major Component Description

Redlock

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.9 inches

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

791D—Redlock-Fernline silt loams, 4 to 15 percent slopes

Setting

Landform:

- Redlock—Lake plains or terraces
- Fernline—Lake plains or terraces

Position on landform:

- Redlock—Treads
- Fernline—Treads

Slope:

- Redlock—4 to 15 percent
- Fernline—4 to 15 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Redlock and similar soils: 60 percent
Fernline and similar soils: 30 percent

Minor Components

Iffgulch and similar soils: 0 to 5 percent
Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Redlock

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.9 inches

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over
glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

791E—Redlock-Fernline silt loams, 15 to 35 percent slopes

Setting

Landform:

- Redlock—Lake plains or terraces
- Fernline—Lake plains or terraces

Position on landform:

- Redlock—Dissected or incised treads
- Fernline—Treads

Slope:

- Redlock—15 to 35 percent
- Fernline—15 to 35 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Redlock and similar soils: 45 percent

Fernline and similar soils: 40 percent

Minor Components

Noxlin silt loam: 0 to 5 percent

Stargulch very fine sandy loam: 0 to 4 percent

Slopes greater than 35 percent: 0 to 4 percent

Iffgulch and similar soils: 0 to 2 percent

Major Component Description

Redlock

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.9 inches

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

792D—Redlock-Fernline-Iffgulch complex, 0 to 15 percent slopes

Setting

Landform:

- Redlock—Lake plains or terraces
- Fernline—Lake plains or terraces
- Iffgulch—Drainageways

Position on landform:

- Redlock—Treads
- Fernline—Treads

Slope:

- Redlock—4 to 15 percent
- Fernline—4 to 15 percent
- Iffgulch—0 to 4 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 28 to 32 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Redlock and similar soils: 45 percent

Fernline and similar soils: 35 percent

Iffgulch and similar soils: 10 percent

Minor Components

Stargulch very fine sandy loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Redlock

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 7.9 inches

Fernline

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over glaciolacustrine

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.3 inches

Iffgulch

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Occasional

Water table: Apparent

Available water capacity: Mainly 9.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Remount Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderate to the Bk horizon; very rapid in the Bk horizon

Landform: Giant ripple marks

Parent material: Alluvium

Slope range: 2 to 25 percent

Elevation: 2,800 to 3,000 feet

Annual precipitation: 13 to 15 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Calcic Argixerolls

Typical Pedon

Remount very gravelly loam, 2 to 12 percent slopes, in an area of pasture, 1,200 feet north and 50 feet east of the southwest corner of sec. 24, T. 20 N., R. 24 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine and medium and few coarse roots; 40 percent pebbles; neutral; abrupt smooth boundary.

A2—7 to 11 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; many fine pores; 55 percent pebbles; neutral; clear smooth boundary.

Bt—11 to 15 inches; light yellowish brown (10YR 6/4) extremely gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, friable, moderately sticky, slightly plastic; few fine and medium roots; many fine pores; common distinct clay films on faces of peds and on surface of pebbles; 75 percent pebbles; slightly alkaline; clear smooth boundary.

Btk—15 to 25 inches; light yellowish brown (10YR 6/4) extremely gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; loose, slightly sticky, slightly plastic; trace of very fine and fine roots; few faint clay films on faces of peds and on surface of pebbles; 85 percent pebbles; common distinct limecasts on undersides of pebbles; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk—25 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) moist; loose, nonsticky, nonplastic; trace of very fine roots; 85 percent pebbles; common distinct limecasts mainly on undersides of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to the Btk horizon: 10 to 24 inches

A horizons

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 10 to 18 percent
 Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles; 35 to 55 percent pebbles
 Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 or 4
 Clay content: 20 to 35 percent
 Content of rock fragments: 60 to 85 percent—0 to 10 percent cobbles; 60 to 75 percent pebbles
 Reaction: pH 7.4 to 7.8

Btk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 or 4
 Clay content: 20 to 35 percent
 Content of rock fragments: 75 to 90 percent—0 to 5 percent cobbles; 75 to 85 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 or 4
 Clay content: 5 to 20 percent
 Content of rock fragments: 75 to 90 percent—0 to 5 percent cobbles; 75 to 85 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

97C—Remount very gravelly loam, 2 to 12 percent slopes

Setting

Landform: Giant ripple marks
Slope: 2 to 12 percent
Elevation: 2,800 to 3,000 feet
Mean annual precipitation: 13 to 15 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Remount and similar soils: 90 percent

Minor Components

Slopes greater than 12 percent: 0 to 5 percent
 Minesinger gravelly loam: 0 to 4 percent
 Belton silt loam: 0 to 1 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

97E—Remount very gravelly loam, 12 to 25 percent slopes

Setting

Landform: Giant ripple marks
Slope: 12 to 25 percent
Elevation: 2,800 to 3,000 feet
Mean annual precipitation: 13 to 15 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Remount and similar soils: 90 percent

Minor Components

Minesinger gravelly loam: 0 to 5 percent
 Bowlake gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

197C—Remount-Bowlake complex, 2 to 12 percent slopes

Setting

Landform:

- Remount—Giant ripple marks
- Bowlake—Giant ripple marks

Position on landform:

- Bowlake—Footslopes and toeslopes

Slope:

- Remount—2 to 12 percent
- Bowlake—2 to 8 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 13 to 15 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Remount and similar soils: 55 percent

Bowlake and similar soils: 30 percent

Minor Components

Slopes greater than 12 percent: 0 to 9 percent

Minesinger gravelly loam: 0 to 6 percent

Major Component Description

Remount

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Bowlake

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Repp Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Colluvium derived from calcareous argillite and quartzite

Slope range: 15 to 70 percent

Elevation: 3,200 to 5,000 feet

Annual precipitation: 18 to 21 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustepts

Typical Pedon

Repp gravelly loam, 35 to 60 percent slopes, in an area of forestland, 1,100 feet south and 1,300 feet west of the northeast corner of sec. 12, T. 16 N., R. 21 W.

Oi—1 inch to 0; mostly undecomposed forest litter.

E—0 to 7 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak coarse granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 20 percent pebbles; neutral; clear smooth boundary.

E/Bw—7 to 18 inches; E part: (80 percent) is light brownish gray (2.5Y 6/2) gravelly loam, grayish brown (2.5Y 5/2) moist; B part: (20 percent) is brown (2.5Y 5/3) gravelly loam, brown (2.5Y 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 30 percent pebbles; neutral; gradual wavy boundary.

Bw—18 to 36 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, olive brown (2.5Y 4/4) moist; common fine and medium roots; 50 percent pebbles; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—36 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly loam, grayish brown (2.5Y 5/2) moist; massive; soft, very friable, nonsticky, slightly plastic; common fine and medium roots; 10 percent cobbles and 65 percent pebbles;

common distinct lime coatings on undersides of coarse fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Depth to the Bk horizon: 25 to 36 inches

E horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 20 to 35 percent—0 to 10 percent cobbles; 20 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

E/Bw horizon

Hue: 2.5Y or 10YR

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 20 to 50 percent—0 to 10 percent cobbles; 20 to 40 percent pebbles

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Content of rock fragments: 60 to 85 percent—0 to 10 percent cobbles; 60 to 75 percent pebbles

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.4 to 8.4

24E—Repp gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Repp and similar soils: 85 percent

Minor Components

Eaglewing gravelly loam: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

24F—Repp gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,200 to 4,600 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Repp and similar soils: 90 percent

Minor Components

Eaglewing gravelly loam: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

26F—Repp gravelly loam, cool, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 3,200 to 5,000 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Repp and similar soils: 85 percent

Minor Components

Yourame gravelly loam: 0 to 5 percent

Eaglewing gravelly loam: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

126G—Repp-Rock outcrop complex, 40 to 70 percent slopes

Setting

Landform: Mountains

Slope: 40 to 70 percent

Elevation: 3,200 to 5,000 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Repp and similar soils: 55 percent

Rock outcrop: 30 percent

Minor Components

Areas of rubble land: 0 to 9 percent

Finleypoint gravelly loam, dry: 0 to 6 percent

Major Component Description

Repp

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Calcareous argillite or quartzite colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 4.7 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Revais Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Annual precipitation: 13 to 18 inches

Frost-free period: 95 to 125 days

Taxonomic Class: Coarse-silty, mixed, active, nonacid, frigid Typic Xerofluvents

Typical Pedon

Revais silt loam, 0 to 2 percent slopes, in an area of forestland, 550 feet north and 650 feet west of the southeast corner of sec. 35, T. 19 N., R. 24 W.

A—0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium and few coarse roots; neutral; clear smooth boundary.

C1—5 to 14 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, slightly sticky, slightly plastic; many fine, common medium, and few coarse roots; neutral; clear smooth boundary.

C2—14 to 38 inches; light brownish gray (10YR 6/2) silt loam consisting of stratified silt loam and very fine sandy loam, grayish brown (10YR 5/2) moist; common fine faint strong brown (7.5YR 5/6) mottles; massive; soft, very friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; neutral; gradual smooth boundary.

C3—38 to 60 inches; light brownish gray (10YR 6/2) silt loam consisting of stratified silt loam and very fine sandy loam, grayish brown (10YR 5/2) moist; common fine faint strong brown (7.5YR 5/6) mottles; massive; soft, very friable, slightly sticky, slightly plastic; few fine and coarse roots; neutral.

Range in Characteristics

Soil temperature: 42 to 45 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

C1 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam or very fine sandy loam

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

C2 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Stratified silt loam or very fine sandy loam

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.3

C3 horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Stratified silt loam, loam, fine sandy loam, or very fine sandy loam

Clay content: 5 to 15 percent; gravelly substratum phase has 0 to 10 percent clay below 40 inches

Reaction: pH 6.6 to 7.3

94A—Revais silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 13 to 15 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Revais and similar soils: 90 percent

Minor Components

Grantsdale silt loam: 0 to 5 percent

Horseplains, rarely flooded: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Rare

Available water capacity: Mainly 10.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

151A—Revais silt loam, gravelly substratum, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 13 to 18 inches

Frost-free period: 95 to 115 days

Composition

Major Components

Revais and similar soils: 85 percent

Minor Components

Hewolf gravelly loam: 0 to 5 percent

Horseplains, occasionally flooded: 0 to 5 percent

Slopes greater than 2 percent: 0 to 3 percent

Lamoose and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: Rare

Available water capacity: Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

200—Riverwash

Composition

Major Components

Riverwash: 90 percent

Minor Components

Horseplains, occasionally flooded: 0 to 8 percent

Lamoose and similar soils: 0 to 2 percent

Major Component Description

Definition: Unstable, flooded areas of sandy or gravelly sediments that support little or no vegetation.

100—Rock outcrop-Rubble land complex

Composition

Major Components

Rock outcrop: 45 percent

Rubble land: 40 percent

Minor Components

Hogsby cobbly loam: 0 to 9 percent

Sharrott gravelly loam: 0 to 6 percent

Major Component Description

Rock outcrop

Definition: Exposures of argillite and quartzite.

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

Rockhill Series

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Volcanic ash over residuum or colluvium

Slope range: 8 to 60 percent

Elevation range: 2,200 to 5,200 feet

Annual precipitation: 24 to 32 inches

Annual air temperature: 40 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Ashy-skeletal, mixed, superactive, frigid Lithic Udivitrands

Typical Pedon

Rockhill very gravelly silt loam, in an area of Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes, in an area of forestland, 800 feet south and 1,100 feet east of the northwest corner of sec. 19, T. 27 N., R. 28 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 4 inches; brown (10YR 5/3) very gravelly silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 5 percent cobbles and 40 percent pebbles; slightly acid; clear smooth boundary.

Bw—4 to 13 inches; light yellowish brown (10YR 6/4) very gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 5 percent cobbles and 50 percent pebbles; slightly acid; clear wavy boundary.

2C—13 to 18 inches; light yellowish brown (10YR 6/4) extremely gravelly silt loam, dark yellowish brown (10YR 4/4) moist; massive; soft, very friable, nonsticky, nonplastic; few fine and medium roots; 10 percent cobbles and 65 percent pebbles; slightly acid; abrupt wavy boundary.

R—18 inches; fractured argillite and quartzite bedrock.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Depth to bedrock: 10 to 20 inches

Depth to the 2C horizon: 10 to 19 inches

Volcanic glass content: 5 to 30 percent

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 2.0 percent

Phosphate retention: 25 to 75 percent

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 4 or 6

Texture: Silt loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

2C horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Texture: Silt loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 85 percent—10 to 20 percent cobbles; 50 to 65 percent pebbles

Reaction: pH 5.6 to 6.5

631E—Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes

Setting

Landform:

- Rockhill—Mountains
- Mitten—Mountains

Slope:

- Rockhill—8 to 35 percent
- Mitten—8 to 35 percent

Elevation: 2,200 to 5,200 feet

Mean annual precipitation: 24 to 32 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rockhill and similar soils: 40 percent

Mitten and similar soils: 30 percent

Rock outcrop: 15 percent

Minor Components

Slopes greater than 35 percent: 0 to 10 percent

Holloway gravelly silt loam: 0 to 5 percent

Major Component Description

Rockhill

Surface layer texture: Very gravelly silt loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.7 inches

Mitten

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

632F—Rockhill-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Mountains

Slope: 15 to 60 percent

Elevation: 2,200 to 5,200 feet

Mean annual precipitation: 24 to 32 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Rockhill and similar soils: 45 percent

Rock outcrop: 40 percent

Minor Components

Holloway gravelly silt loam: 0 to 5 percent

Mitten gravelly silt loam: 0 to 5 percent

Rubble land: 0 to 5 percent

Major Component Description

Rockhill

Surface layer texture: Very gravelly silt loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.7 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Round Butte Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 0 to 15 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, illitic, frigid Typic Natrixeralfs

Typical Pedon

Round Butte silty clay loam, 0 to 2 percent slopes, in an area of irrigated cropland, 2,100 feet north and 1,500 feet east of the southwest corner of sec. 12, T. 22 N., R. 24 W.

Ap—0 to 10 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common fine, medium, and coarse roots; slightly alkaline; abrupt smooth boundary.

Btn—10 to 18 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; strong fine and medium angular blocky structure; hard, firm, moderately sticky, very plastic; many fine and common medium roots; many prominent clay films on faces of peds; moderately alkaline; clear smooth boundary.

Bkn—18 to 24 inches; very pale brown (2.5Y 7/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; faint 1/8- to 1/4-inch varves; hard, very firm, moderately sticky, very plastic; common fine and medium roots; common fine seams of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—24 to 38 inches; very pale brown (2.5Y 7/4) silty clay, light olive brown (2.5Y 5/4) moist; massive;

distinct 1/8- to 1/4-inch varves; very hard, very firm, moderately sticky, very plastic; common fine and few medium roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C2—38 to 50 inches; white (2.5Y 8/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; massive; loose, nonsticky, nonplastic; few fine roots; moderately alkaline; abrupt smooth boundary.

C3—50 to 60 inches; pale yellow (2.5Y 7/4) stratified silt loam and clay, light olive brown (2.5Y 5/4) moist; massive, distinct 1/16- to 1/8-inch varves; hard, very firm, moderately sticky, very plastic; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the varved lake sediments: Greater than 20 inches

Depth to the Bkn horizon: 10 to 20 inches

Note: The C2 horizon is not present in all pedons.

Ap horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 7.4 to 7.8

Btn horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 8.4

Bkn horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Silty clay or silty clay loam

Clay content: 35 to 50 percent

Calcium carbonate equivalent: 8 to 15 percent

Electrical conductivity (mmhos/cm): 2 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 8.4

C1 horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 30 to 50 percent

Electrical conductivity (mmhos/cm): 1 to 3

Sodium adsorption ratio: 13 to 30

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 8.4

C2 horizon

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 30 to 50 percent

Electrical conductivity (mmhos/cm): 1 to 3

Sodium adsorption ratio: 13 to 30

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 8.4

C3 horizon

Hue: 2.5Y or 10YR

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Stratified silt loam or clay

Clay content: 30 to 50 percent

Electrical conductivity (mmhos/cm): 1 to 3

Sodium adsorption ratio: 13 to 30

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.9 to 8.4

13A—Round Butte silty clay loam, 0 to 2 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Round Butte and similar soils: 85 percent

Minor Components

Sonyok silty clay loam: 0 to 9 percent

Marklepass silty clay loam: 0 to 4 percent

Slopes greater than 2 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

13B—Round Butte silty clay loam, 2 to 8 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 2 to 8 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Round Butte and similar soils: 85 percent

Minor Components

Vincom silt loam: 0 to 5 percent

Lonepine silt loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

113D—Round Butte-Irvine silty clay loams, 4 to 15 percent slopes

Setting

Landform:

- Round Butte—Lake plains or terraces

- Irvine—Lake plains or terraces

Position on landform:

- Round Butte—Dissected or incised treads

- Irvine—Dissected or incised treads

Slope:

- Round Butte—4 to 15 percent

- Irvine—4 to 15 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Round Butte and similar soils: 55 percent

Irvine and similar soils: 30 percent

Minor Components

Lonepine silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Areas of lake sediment outcrop: 0 to 5 percent

Major Component Description

Round Butte

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

Irvine

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

213A—Round Butte-Selow complex, 0 to 2 percent slopes

Setting

Landform:

- Round Butte—Lake plains or terraces
- Selow—Lake plains or terraces

Slope:

- Round Butte—0 to 2 percent
- Selow—0 to 2 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Round Butte and similar soils: 45 percent

Selow and similar soils: 40 percent

Minor Components

Sonyok silty clay loam: 0 to 7 percent

Kerrdam silt loam: 0 to 5 percent

Slopes greater than 2 percent: 0 to 3 percent

Major Component Description

Round Butte

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

Selow

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

213B—Round Butte-Selow complex, 2 to 8 percent slopes

Setting

Landform:

- Round Butte—Lake plains or terraces
- Selow—Lake plains or terraces

Slope:

- Round Butte—2 to 8 percent
- Selow—2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Round Butte and similar soils: 45 percent

Selow and similar soils: 40 percent

Minor Components

Kerrdam silt loam: 0 to 5 percent

Sonyok silty clay loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Round Butte

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.7 inches

Selow

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 9.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Rumblecreek Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Moraines and mountains

Parent material: Alpine till and drift derived from argillite and quartzite

Slope range: 4 to 50 percent

Elevation: 3,200 to 5,000 feet

Annual precipitation: 25 to 34 inches

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Haplic Glossudalfs

Typical Pedon

Rumblecreek gravelly loam, 4 to 15 percent slopes, in an area of forestland, 2,700 feet south and 800 feet east of the northwest corner of sec. 4, T. 17 N., R. 22 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 8 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 20 percent pebbles; neutral; clear smooth boundary.

E/Bt—8 to 22 inches; E part (60 percent) is light brownish gray (10YR 6/2) gravelly loam, grayish brown (10YR 5/2) moist; B part (40 percent) is brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium and coarse roots; few faint clay films on faces of peds; 5 percent cobbles and 25 percent pebbles; slightly acid; gradual wavy boundary.

Bt/E—22 to 30 inches; B part (70 percent) is brown (10YR 5/3) very gravelly clay loam, brown (10YR 4/3) moist; E part (30 percent) is light brownish gray (10YR 6/2) very gravelly clay loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and coarse roots; 10 percent cobbles and 35 percent pebbles; common distinct clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt—30 to 60 inches; brown (10YR 5/3) very gravelly clay loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few medium and coarse roots; 40 percent pebbles; many distinct clay films on faces of peds; slightly acid.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the argillic horizon: 10 to 22 inches

E horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 30 percent pebbles

Reaction: pH 5.1 to 7.3

E/Bt horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 5.1 to 7.3

Bt/E horizon

Hue: 10YR or 7.5YR

Value: B part: 5 or 6 dry, 4 or 5 moist; E part: 6 or 7 dry; 5 or 6 moist

Chroma: B part: 3 or 4; E part: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 7.8

Bt horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Clay content: 27 to 35 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 7.8

36D—Rumblecreek gravelly loam, 4 to 15 percent slopes

Setting

Landform: Moraines

Slope: 4 to 15 percent

Elevation: 3,400 to 5,000 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Wildgen gravelly loam: 0 to 5 percent
 Bata gravelly silt loam: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36E—Rumblecreek gravelly loam, 15 to 30 percent slopes

Setting

Landform: Moraines
Slope: 15 to 30 percent
Elevation: 3,400 to 5,000 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Wildgen gravelly loam: 0 to 5 percent
 Bata gravelly silt loam: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

36F—Rumblecreek gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,400 to 4,600 feet
Mean annual precipitation: 26 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Wildgen gravelly loam: 0 to 5 percent
 Bata gravelly silt loam: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**37D—Rumblecreek gravelly loam, dry,
4 to 15 percent slopes****Setting***Landform:* Moraines*Slope:* 4 to 15 percent*Elevation:* 3,400 to 4,800 feet*Mean annual precipitation:* 25 to 29 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Rumblecreek and similar soils: 85 percent

Minor Components

Half moon silt loam, cool: 0 to 4 percent

Bata gravelly silt loam: 0 to 4 percent

Winfall gravelly loam: 0 to 4 percent

Slopes greater than 15 percent: 0 to 3 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till or glacial drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**37E—Rumblecreek gravelly loam, dry,
15 to 30 percent slopes****Setting***Landform:* Moraines*Slope:* 15 to 30 percent*Elevation:* 3,400 to 4,800 feet*Mean annual precipitation:* 25 to 29 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Rumblecreek and similar soils: 85 percent

Minor Components

Winfall gravelly loam: 0 to 5 percent

Half moon silt loam, cool: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till or glacial drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**37F—Rumblecreek gravelly loam, dry,
30 to 50 percent slopes****Setting***Landform:* Mountains*Slope:* 30 to 50 percent*Elevation:* 3,400 to 4,800 feet*Mean annual precipitation:* 25 to 29 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Rumblecreek and similar soils: 85 percent

Minor Components

Winfall gravelly loam: 0 to 5 percent

Slopes greater than 50 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Major Component Description*Surface layer texture:* Gravelly loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alpine till or glacial drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

392D—Rumblecreek gravelly loam, 8 to 15 percent slopes, stony

Setting

Landform: Moraines
Position on landform: Treads
Slope: 8 to 15 percent
Elevation: 3,200 to 3,600 feet
Mean annual precipitation: 26 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 85 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
Mollman gravelly loam: 0 to 4 percent
Half moon silt loam, cool: 0 to 3 percent
Bata gravelly silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

392E—Rumblecreek gravelly loam, 15 to 30 percent slopes, stony

Setting

Landform: Moraines
Position on landform: Risers

Slope: 15 to 30 percent
Elevation: 3,200 to 3,600 feet
Mean annual precipitation: 26 to 30 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Rumblecreek and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent
Mollman gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.7 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Sacheen Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Very rapid
Landform: Stream terraces, escarpments, and sand dunes
Parent material: Eolian deposits
Slope range: 2 to 60 percent
Elevation: 2,400 to 2,800 feet
Annual precipitation: 14 to 20 inches
Frost-free period: 100 to 125 days

Taxonomic Class: Mixed, frigid Typic
Xeropsamments

Typical Pedon

Sacheen loamy fine sand, dry, 2 to 8 percent slopes, in an area of pasture, 1,100 feet south and 2,500 feet west of the northeast corner of sec. 29, T. 20 N., R. 21 W.

A—0 to 8 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; loose,

nonsticky, nonplastic; common very fine and fine roots; neutral; clear smooth boundary.

C—8 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; neutral.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 4 or 5 dry; 2, 3, or 4 moist

Chroma: 2 or 3

Texture: Loamy fine sand or fine sand

Clay content: 3 to 8 percent

Reaction: pH 6.1 to 7.3

C horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loamy fine sand or fine sand

Clay content: 3 to 8 percent

Reaction: pH 6.1 to 7.3

6B—Sacheen loamy fine sand, dry, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 90 percent

Minor Components

Selon fine sandy loam: 0 to 5 percent

Sacheen fine sand: 0 to 3 percent

Slopes greater than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

6E—Sacheen loamy fine sand, dry, 8 to 30 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 8 to 30 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 14 to 16 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 85 percent

Minor Components

Selon, gravelly throughout: 0 to 7 percent

Sacheen fine sand: 0 to 5 percent

Selon fine sandy loam: 0 to 3 percent

Major Component Description

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41C—Sacheen loamy fine sand, 2 to 8 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 2 to 8 percent
Elevation: 2,400 to 2,600 feet
Mean annual precipitation: 16 to 18 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 90 percent

Minor Components

Selon fine sandy loam: 0 to 5 percent
 Sacheen fine sand: 0 to 3 percent
 Slopes greater than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41E—Sacheen loamy fine sand, 8 to 30 percent slopes

Setting

Landform: Stream terraces
Position on landform: Dissected or incised treads
Slope: 8 to 30 percent
Elevation: 2,400 to 2,600 feet
Mean annual precipitation: 16 to 18 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 90 percent

Minor Components

Selon fine sandy loam: 0 to 5 percent
 Sacheen fine sand: 0 to 3 percent
 Selon, gravelly throughout: 0 to 2 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

41F—Sacheen loamy fine sand, 30 to 60 percent slopes

Setting

Landform: Escarpments
Slope: 30 to 60 percent
Elevation: 2,400 to 2,800 feet
Mean annual precipitation: 15 to 17 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 85 percent

Minor Components

Selon fine sandy loam: 0 to 5 percent
 Selon, gravelly throughout: 0 to 5 percent
 Sacheen fine sand: 0 to 5 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

106D—Sacheen-Dune land complex, 4 to 15 percent slopes

Setting

Landform:

- Sacheen—Sand dunes
- Dune land—Sand dunes

Slope: 4 to 15 percent

Elevation: 2,600 to 2,800 feet

Mean annual precipitation: 13 to 16 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 50 percent

Dune land: 35 percent

Minor Components

Slopes greater than 15 percent: 0 to 9 percent

Selon, gravelly throughout: 0 to 6 percent

Major Component Description

Sacheen

Surface layer texture: Fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.0 inches

Dune land

Definition: Mounds, ridges, or hills of windblown sand that may be covered in vegetation or bare.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

411E—Sacheen-Rock outcrop complex, 8 to 30 percent slopes

Setting

Landform: Stream terraces

Position on landform: Dissected or incised treads

Slope: 8 to 30 percent

Elevation: 2,400 to 2,800 feet

Mean annual precipitation: 15 to 17 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sacheen and similar soils: 60 percent

Rock outcrop: 30 percent

Minor Components

Selon, gravelly throughout: 0 to 6 percent

Sacheen fine sand: 0 to 2 percent

Selon fine sandy loam: 0 to 2 percent

Major Component Description

Sacheen

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Scotmont Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Lake plains and terraces

Parent material: Glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,300 to 2,800 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 115 days

Taxonomic Class: Coarse-loamy, mixed,
superactive, frigid Vitrandic Hapludalfs

Typical Pedon

Scotmont fine sandy loam, 4 to 15 percent slopes, in an area of forestland, 800 feet south and 1,500 feet west of the northeast corner of sec. 6, T. 21 N., R. 29 W.

Oi—1 to 0 inches; undecomposed and slightly decomposed forest litter.

A—0 to 7 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

E—7 to 14 inches; brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

E and Bt1—14 to 28 inches; E part (90 percent) is brown (10YR 5/3) fine sandy loam, very pale brown (10YR 7/3) dry; massive; soft, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; B part (10 percent) is yellowish brown (10YR 5/4) $\frac{1}{8}$ - to $\frac{3}{8}$ -inch thick fine sandy loam lamellae, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common clay films bridging sand grains; common fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

E and Bt2—28 to 43 inches; E part (80 percent) is brown (10YR 5/3) loamy very fine sand, very pale brown (10YR 7/3) dry; massive; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; B part (20 percent) is yellowish brown (10YR 5/4) $\frac{3}{8}$ - to 1 $\frac{1}{2}$ -inch thick very fine sandy loam lamellae, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many clay films bridging sand grains; common fine and medium and few coarse roots; slightly acid; clear wavy boundary.

E and Bt3—43 to 60 inches; E part (50 percent) is brown (10YR 5/3) loamy fine sand, very pale brown (10YR 7/3) dry; massive; soft, very friable, nonsticky, nonplastic; common medium and few coarse roots; B part (50 percent) is yellowish brown (10YR 5/4) $\frac{3}{8}$ - to 2-inch thick fine sandy loam lamellae, very pale brown (10YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many clay films bridging sand grains; common medium and few coarse roots; slightly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 4 to 10 percent

Moist bulk density: 1.0 to 1.40 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.1 to 6.5

E horizon

Value: 6 or 7 dry; 5 or 6 moist

Clay content: 4 to 10 percent

Moist bulk density: 1.0 to 1.40 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.1 to 6.5

E and Bt1 horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5, 6, or 7 dry, 4 or 5 moist

Texture: E part: Loamy fine sand or fine sandy loam; B part: Fine sandy loam

Clay content: E part: 4 to 10 percent; B part: 8 to 15 percent

Reaction: pH 5.6 to 6.5

E and Bt2 horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5, 6 or 7 dry, 4 or 5 moist

Texture: E part: Loamy fine sand or loamy very fine sand; B part: Fine sandy loam or very fine sandy loam

Clay content: E part: 4 to 10 percent; B part: 8 to 15 percent

Reaction: pH 5.6 to 6.5

E and Bt3 horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5, 6, or 7 dry, 4 or 5 moist

Texture: E part: Loamy fine sand; B part: Fine sandy loam

Clay content: E part: 4 to 10 percent; B part: 8 to 15 percent
Reaction: pH 5.6 to 6.5

61B—Scotmont fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 2,300 to 2,800 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 100 to 115 days

Composition

Major Components

Scotmont and similar soils: 85 percent

Minor Components

Lionwood loam: 0 to 9 percent
Whitepine silt loam: 0 to 3 percent
Slopes greater than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

61D—Scotmont fine sandy loam, 4 to 15 percent slopes

Setting

Landform: Lake plains or terraces
Position on landform: Treads
Slope: 4 to 15 percent
Elevation: 2,300 to 2,800 feet
Mean annual precipitation: 24 to 28 inches
Frost-free period: 100 to 115 days

Composition

Major Components

Scotmont and similar soils: 85 percent

Minor Components

Lionwood loam: 0 to 8 percent
Slopes greater than 15 percent: 0 to 4 percent
Whitepine silt loam: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Selon Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Stream terraces and escarpments
Parent material: Alluvium
Slope range: 0 to 60 percent
Elevation range: 2,300 to 2,900 feet
Annual precipitation: 15 to 24 inches
Annual air temperature: 40 to 45 degrees F
Frost-free period: 100 to 125 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Haploxerepts

Typical Pedon

Selon fine sandy loam, 4 to 15 percent slopes, in an area of forestland, 900 feet south and 300 feet west of the northeast corner of sec. 5, T. 19 N., R. 26 W.

Oi—1 inch to 0; partially decomposed organic matter.
A—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; neutral; clear smooth boundary.

E—3 to 15 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium and few coarse roots; slightly acid; gradual wavy boundary.

E/Bw—15 to 50 inches; E part (85 percent) is very pale brown (10YR 7/3) fine sandy loam, yellowish brown (10YR 5/4) moist; B part (15 percent) is brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; few medium and coarse roots; slightly acid; gradual wavy boundary.

C—50 to 60 inches; very pale brown (10YR 7/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; few medium and coarse roots; moderately acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

E horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

E/Bw horizon

Hue: 10YR or 2.5Y

Value: E part: 5, 6, or 7 dry, 4, 5, or 6 moist;

B part: 4 or 5 dry, 4 or 5 moist

Chroma: E part: 3 or 4; B part: 3, 4, 5, or 6

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3 or 4

Clay content: 10 to 18 percent

Reaction: pH 5.6 to 7.3

42B—Selon fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,400 to 2,900 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

McCollum fine sandy loam: 0 to 5 percent

Bemishave loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

42D—Selon fine sandy loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,400 to 2,900 feet

Mean annual precipitation: 16 to 18 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Sacheen loamy fine sand: 0 to 5 percent

Bemishave loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

421B—Selon fine sandy loam, moist, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Scotmont fine sandy loam: 0 to 5 percent

Selon, gravelly throughout: 0 to 3 percent

McCollum fine sandy loam: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

421D—Selon fine sandy loam, moist, 4 to 15 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Scotmont fine sandy loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Selon, gravelly throughout: 0 to 3 percent

McCollum fine sandy loam: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

421E—Selon fine sandy loam, moist, 15 to 30 percent slopes

Setting

Landform: Stream terraces

Position on landform: Dissected or incised treads

Slope: 15 to 30 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Sacheen loamy fine sand: 0 to 5 percent

Selon, gravelly throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

422F—Selon-Bemishave complex, 15 to 60 percent slopes

Setting

Landform:

- Selon—Escarpments
- Bemishave—Escarpments

Position on landform:

- Selon—Backslopes and side slopes
- Bemishave—Footslopes

Slope:

- Selon—15 to 60 percent
- Bemishave—15 to 35 percent

Elevation: 2,400 to 2,700 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Selon and similar soils: 45 percent

Bemishave and similar soils: 40 percent

Minor Components

McCollum fine sandy loam: 0 to 8 percent

Bigarm gravelly loam: 0 to 6 percent

Slopes greater than 60 percent: 0 to 1 percent

Major Component Description

Selon

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.1 inches

Bemishave

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

842E—Selon fine sandy loam, 15 to 30 percent slopes

Setting

Landform: Stream terraces

Position on landform: Dissected or incised treads

Slope: 15 to 30 percent
Elevation: 2,400 to 2,900 feet
Mean annual precipitation: 16 to 18 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Sacheen loamy fine sand: 0 to 5 percent
 Bemishave loam: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

842F—Selon fine sandy loam, 30 to 60 percent slopes

Setting

Landform: Escarpments
Slope: 30 to 60 percent
Elevation: 2,400 to 2,900 feet
Mean annual precipitation: 16 to 18 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Selon and similar soils: 85 percent

Minor Components

Selon, gravelly throughout: 0 to 5 percent
 Slopes greater than 60 percent: 0 to 4 percent
 Sacheen loamy fine sand: 0 to 3 percent
 Bemishave loam: 0 to 3 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Selow Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Very slow to 2Bk horizon; moderate below this depth
Landform: Lake plains and terraces
Parent material: Lacustrine deposits
Slope range: 0 to 15 percent
Elevation: 2,500 to 3,000 feet
Annual precipitation: 12 to 14 inches
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, illitic, frigid Typic Natrixeralfs

Typical Pedon

Selow silt loam, in an area of Dryfork-Selow silt loams, 0 to 4 percent slopes, in an area of pasture, 50 feet south and 300 feet east of the northwest corner of sec. 13, T. 21 N., R. 23 W.

Ap—0 to 8 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many fine and common medium roots; many very fine and fine discontinuous tubular pores; slightly alkaline; abrupt smooth boundary.

B_{tn}—8 to 14 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/3) moist; weak medium prismatic structure parting to strong fine and medium angular blocky; very hard, firm, very sticky, very plastic; many fine and few medium roots; few very fine discontinuous tubular pores; many prominent clay films on faces of peds and in pores; strongly alkaline; clear smooth boundary.

B_{tnk}—14 to 20 inches; very pale brown (10YR 7/4) silty clay loam, yellowish brown (10YR 5/4) moist;

strong medium subangular blocky structure; hard, firm, moderately sticky, very plastic; common fine roots; few faint clay films on faces of peds; common fine masses of lime; violently effervescent; strongly alkaline; abrupt smooth boundary.

2Bk—20 to 28 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

2C—28 to 60 inches; light gray (10YR 7/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, nonsticky, nonplastic; few fine roots; disseminated lime; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Btnk horizon: 12 to 20 inches

Depth to lithologic discontinuity: 18 to 30 inches

Notes: When uncultivated, the Ap horizon is designated an E horizon. The Btnk horizon may contain faint to distinct lake varves. The 2Bk horizon may not be present in all profiles.

Ap horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.8

Btn horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent

Electrical conductivity (mmhos/cm): 1 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.9 to 9.0

Btnk horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 3 or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 1 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 8.5 to 9.6

2Bk horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or very fine sandy loam

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 30

Reaction: pH 8.5 to 9.6

2C horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam, very fine sandy loam, or loamy very fine sand

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 1 to 5 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 8.5 to 9.0

Selway Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Colluvium

Slope range: 8 to 30 percent

Elevation: 4,400 to 5,400 feet

Annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Eutrudepts

Typical Pedon

Selway gravelly sandy loam, 8 to 30 percent slopes, in an area of forestland, 2,200 feet south and 300 feet east of the northwest corner of sec. 29, T. 18 N., R. 23 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E—0 to 8 inches; light brownish gray (10YR 6/2) gravelly sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; common very fine pores; 30 percent pebbles; slightly acid; gradual wavy boundary.

E/Bw—8 to 26 inches; E part (70 percent) is pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; B part (30 percent) is light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic;

many very fine, fine, and medium and few coarse roots; common very fine pores; 45 percent pebbles; moderately acid; clear wavy boundary.
 BC—26 to 60 inches; brown (10YR 5/3) very gravelly sandy loam, brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; few medium and coarse roots; 55 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 8 and 24 inches

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 4, 5, or 6 dry, 3 or 4 moist

Chroma: E part: 3 or 4; B part: 4 or 6

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 75 percent pebbles

Reaction: pH 5.6 to 6.5

BC horizon

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 3, 4, or 6

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 80 percent—0 to 10 percent cobbles; 35 to 70 percent pebbles

Reaction: pH 5.6 to 6.5

89E—Selway gravelly sandy loam, 8 to 30 percent slopes

Setting

Landform: Mountains

Position on landform: Backslopes, footslopes, and side slopes

Slope: 8 to 30 percent

Elevation: 4,400 to 5,400 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Selway and similar soils: 85 percent

Minor Components

Tevis gravelly loam, dry: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Selway stony sandy loam: 0 to 4 percent

Selway, bouldery: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Gneiss or schist colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Sharrott Series

Depth class: Shallow

Drainage class: Well drained

Permeability: Moderate

Landform: Mountains

Parent material: Residuum and colluvium derived from argillite and quartzite

Slope range: 8 to 85 percent

Annual precipitation: 18 to 21 inches

Elevation: 2,500 to 5,200 feet

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Haplusteps

Typical Pedon

Sharrott gravelly loam, in an area of Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes, in an area of forestland, 1,300 feet north and 300 feet west of the southeast corner of sec. 15, T. 18 N., R. 24 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; many very fine and fine and common medium roots;

1 percent stones and 20 percent pebbles; slightly acid; clear smooth boundary.

Bw—4 to 10 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, nonplastic; many very fine and fine and common medium roots; 10 percent cobbles and 35 percent pebbles; slightly acid; clear smooth boundary.

BC—10 to 12 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky, nonplastic; common fine and medium roots; 10 percent cobbles and 60 percent pebbles; slightly acid; gradual smooth boundary.

R—12 inches; argillite bedrock.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

Depth to bedrock: 10 to 20 inches

A horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent stones and cobbles; 15 to 30 percent pebbles

Reaction: pH 5.6 to 6.5

Bw horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 10 to 15 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

BC horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 65 to 80 percent—5 to 10 percent cobbles; 60 to 70 percent pebbles

Reaction: pH 5.6 to 6.5

80F—Sharrott-Rubble land-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Mountains

Slope: 15 to 60 percent

Elevation: 2,500 to 4,200 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 80 to 90 days

Composition

Major Components

Sharrott and similar soils: 35 percent

Rubble land: 30 percent

Rock outcrop: 20 percent

Minor Components

Winkler gravelly loam: 0 to 9 percent

Sharrott gravelly loam, cool: 0 to 6 percent

Major Component Description

Sharrott

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.2 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

82F—Sharrott, cool-Rock outcrop-Rubble land complex, 15 to 60 percent slopes

Setting

Landform: Mountains

Slope: 15 to 60 percent

Elevation: 2,500 to 4,800 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Sharrott and similar soils: 45 percent

Rock outcrop: 25 percent

Rubble land: 20 percent

Minor Components

Winkler gravelly loam, cool: 0 to 10 percent

Major Component Description**Sharrott**

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.1 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Sonyok Series

Depth class: Very deep

Drainage class: Very poorly drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 0 to 4 percent

Elevation: 2,600 to 2,900 feet

Annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, mixed, active, nonacid, frigid
Aeric Halaquepts

Typical Pedon

Sonyok silty clay loam, 0 to 4 percent slopes, in an area of pasture, 2,540 feet south and 1,320 feet west of the northeast corner of sec. 2, T. 21 N., R. 24 W.

Oi—3 inches to 0; undecomposed and partially decomposed matted roots.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silty clay loam, light gray (10YR 7/2) dry; many fine distinct light olive brown (2.5Y 5/6) redox concentrations; moderate medium subangular blocky structure;

hard, firm, moderately sticky, moderately plastic; many very fine, fine, and medium roots; neutral; clear smooth boundary.

Bwn1—7 to 15 inches; brown (10YR 4/3) silty clay, very pale brown (10YR 7/3) dry; many fine distinct light olive brown (2.5Y 5/6) redox concentrations; strong medium angular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common fine and medium roots; slightly alkaline; clear smooth boundary.

Bwn2—15 to 25 inches; yellowish brown (10YR 5/4) silty clay, pale brown (10YR 6/3) dry; many fine distinct light olive brown (2.5Y 5/6) redox concentrations; moderate coarse subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; few fine roots; slightly alkaline; abrupt smooth boundary.

C—25 to 60 inches; pale brown (10YR 6/3) silty clay, light gray (10YR 7/2) dry; massive, distinct 1/8- to 1/4-inch varves; very hard, very firm, moderately sticky, moderately plastic; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the seasonal high water table: Ponded to 12 inches

Depth to the varved lake sediments: 20 to 60 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 1 or 2

Clay content: 27 to 40 percent

Electrical conductivity (mmhos/cm): 0 to 1

Sodium adsorption ratio: 4 to 13

Reaction: pH 6.6 to 7.3

Bwn horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 moist; 6 or 7 dry

Chroma: 3, 4, or 6

Texture: Silty clay or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity (mmhos/cm): 1 to 4

Sodium adsorption ratio: 13 to 40

Reaction: pH 7.4 to 7.8

C horizon

Value: 5, 6, or 7 moist; 6, 7, or 8 dry

Texture: Silty clay, clay, or silty clay loam

Clay content: 35 to 50 percent

Electrical conductivity (mmhos/cm): 1 to 3

Sodium adsorption ratio: 4 to 30

Reaction: pH 7.9 to 8.4

513A—Sonyok silty clay loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Slope: 0 to 4 percent

Elevation: 2,600 to 2,900 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sonyok and similar soils: 85 percent

Minor Components

Round Butte silty clay loam: 0 to 9 percent

Bolack silt loam: 0 to 6 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Lacustrine deposits

Flooding: Frequent

Ponding: Long

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 8.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Stargulch Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Volcanic ash over alluvium or outwash

Slope range: 0 to 15 percent

Annual precipitation: 30 to 34 inches

Elevation range: 2,200 to 2,600 feet

Annual air temperature: 42 to 45 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Andic Hapludalfs

Typical Pedon

Stargulch very fine sandy loam, 0 to 4 percent slopes, in an area of forestland, 1,200 feet north and 1,800 feet west of the southeast corner of sec. 27, T. 27 N., R. 34 W.

A—0 to 2 inches; dark brown (10YR 3/3) very fine sandy loam, brown (10YR 5/3) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; moderately acid; clear wavy boundary.

Bw1—2 to 8 inches; dark yellowish brown (10YR 4/4) very fine sandy loam, yellowish brown (10YR 5/6) dry; weak fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; moderately acid; clear wavy boundary.

Bw2—8 to 13 inches; dark yellowish brown (10YR 4/4) very fine sandy loam, brownish yellow (10YR 6/6) dry; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine and fine and common medium and coarse roots; moderately acid; clear wavy boundary.

2E and Bt1—13 to 25 inches; E part (90 percent) is brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; B part (10 percent) is dark yellowish brown (10YR 4/4) fine sandy loam lamellae, $\frac{1}{4}$ - to $\frac{3}{8}$ -inch thick, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; moderately acid; gradual wavy boundary.

2E and Bt2—25 to 44 inches; E part (70 percent) is brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; massive; soft, very friable, nonsticky, nonplastic; common fine and medium and few coarse roots; moderately acid; B part (30 percent) is dark yellowish brown (10YR 4/4) 1- to 2-inch thick fine sandy loam lamellae, light yellowish brown (10YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many clay films bridging sand grains; common fine and medium, and few coarse roots; moderately acid; gradual wavy boundary.

2Bt and E—44 to 60 inches; B part (60 percent) is dark yellowish brown (10YR 4/4) 1- to 2-inch thick fine sandy loam lamellae, light yellowish brown (10YR 6/4) dry; moderate medium subangular

blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many clay films bridging sand grains; few fine, medium, and coarse roots; moderately acid; E part (40 percent) is brown (10YR 5/3) loamy fine sand, pale brown (10YR 6/3) dry; massive; soft, very friable, nonsticky, nonplastic; few fine, medium, and coarse roots; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

A horizon

Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Clay content: 0 to 6 percent
Moist bulk density: 0.85 to 1.0 g/cm³
Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1.0 to 1.5 percent
Reaction: pH 5.1 to 6.5

Bw horizons

Value: 5 or 6 dry; 4 or 5 moist
Clay content: 0 to 6 percent
Moist bulk density: 0.85 to 1.0 g/cm³
Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 1 to 2 percent
Reaction: pH 5.1 to 6.5

2E and Bt1 horizon

Value: 5 or 6 dry; 4 or 5 moist
Clay content: E part: 0 to 6 percent; B part: 8 to 12 percent
Reaction: pH 5.6 to 6.5

2E and Bt2 horizon

Value: 5 or 6 dry; 4 or 5 moist
Clay content: E part: 0 to 6 percent; B part: 8 to 12 percent
Reaction: pH 5.6 to 6.5

2Bt and E horizon

Value: 5 or 6 dry; 4 or 5 moist
Clay content: B part: 8 to 12 percent; E part: 0 to 6 percent
Reaction: pH 5.6 to 6.5

91D—Stargulch very fine sandy loam, 4 to 15 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 30 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Stargulch and similar soils: 85 percent

Minor Components

Berray silt loam: 0 to 5 percent

Tamarack moist: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Very fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

891B—Stargulch very fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,200 to 2,600 feet

Mean annual precipitation: 30 to 34 inches

Frost-free period: 90 to 105 days

Composition

Major Components

Stargulch and similar soils: 90 percent

Minor Components

Berray silt loam: 0 to 4 percent

Tamarack moist: 0 to 4 percent

Slopes greater than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Very fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 8.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Stevie Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderate to the 2E/Bw horizon; moderately rapid below this depth

Landform: Mountains

Parent material: Volcanic ash over colluvium

Slope range: 15 to 70 percent

Elevation range: 2,500 to 5,000 feet

Annual precipitation: 28 to 40 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Ashy over loamy-skeletal, mixed, superactive, frigid Typic Udivitrands

Typical Pedon

Stevie gravelly silt loam, 35 to 60 percent slopes, in an area of forestland, 1,400 feet north and 400 feet east of the southwest corner of sec. 35, T. 26 N., R 32 W.

Oi—1 inch to 0; slightly decomposed forest litter.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) gravelly silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine and medium and common very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; abrupt wavy boundary.

Bw1—1 to 7 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure parting to weak fine and medium granular; soft, very friable, nonsticky, nonplastic; many fine and medium and common very fine, fine, medium, and coarse roots; 5 percent cobbles and 15 percent pebbles; slightly acid; gradual wavy boundary.

Bw2—7 to 17 inches; dark yellowish brown (10YR 4/4) gravelly silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and medium

subangular blocky structure parting to moderate fine granular; soft, very friable, nonsticky, nonplastic; common fine, medium, and coarse roots; 5 percent cobbles and 25 percent pebbles; moderately acid; abrupt wavy boundary.

2E/Bw—17 to 42 inches; E part (80 percent)

is grayish brown (10YR 5/2) very cobbly sandy loam, light gray (10YR 7/2) dry; B part (20 percent) is brown (10YR 5/3) very cobbly sandy loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky, slightly plastic; common fine, medium, and coarse roots; 20 percent cobbles and 30 percent pebbles; slightly acid; gradual wavy boundary.

2C—42 to 60 inches; grayish brown (10YR 5/2) extremely cobbly sandy loam, light gray (10YR 7/2) dry; massive; slightly hard, friable, nonsticky, slightly plastic; few medium and coarse roots; 30 percent cobbles and 40 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Volcanic glass content in the 0.02 to 2.0 mm fraction: 12 to 20 percent

Acid-oxalate extractable Al + $\frac{1}{2}$ Fe: 1.60 to 2.25 percent

Phosphate retention: 25 to 75

15-bar water retention on air-dried samples: 8 to 12 percent

A horizon

Value: 4 or 5 dry; 2, 3, or 4 moist

Chroma: 2 or 3

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 15 to 25 percent—0 to 5 percent cobbles; 15 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

Bw1 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 15 to 30 percent—0 to 5 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 5.6 to 6.5

Bw2 horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 3, 4, or 6

Clay content: 2 to 10 percent

Moist bulk density: 0.85 to 1.00 g/cm³

Content of rock fragments: 15 to 30 percent—0 to 5 percent cobbles; 15 to 25 percent pebbles
Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 2, 3, or 4
Clay content: 2 to 10 percent
Content of rock fragments: 45 to 60 percent—15 to 20 percent cobbles; 30 to 40 percent pebbles
Reaction: pH 5.6 to 6.5

2C horizon

Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Clay content: 2 to 10 percent
Content of rock fragments: 60 to 80 percent—20 to 30 percent cobbles; 40 to 50 percent pebbles
Reaction: pH 5.6 to 6.5

**87F—Stevie gravelly silt loam,
35 to 60 percent slopes**

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 28 to 40 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Stevie and similar soils: 90 percent

Minor Components

Mitten gravelly silt loam: 0 to 5 percent
Areas of rubble land: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**871G—Stevie-Rock outcrop complex,
40 to 70 percent slopes**

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 28 to 40 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Stevie and similar soils: 60 percent
Rock outcrop: 30 percent

Minor Components

Rockhill: 0 to 5 percent
Areas of rubble land: 0 to 5 percent

Major Component Description

Stevie

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**887E—Stevie gravelly silt loam,
15 to 35 percent slopes**

Setting

Landform: Mountains
Slope: 15 to 35 percent

Elevation: 2,500 to 5,000 feet
Mean annual precipitation: 28 to 40 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Stevie and similar soils: 90 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent
 Mitten gravelly silt loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tallcreek Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Landform: Stream terraces
Parent material: Glaciolacustrine deposits
Slope range: 0 to 4 percent
Elevation range: 3,300 to 3,800 feet
Annual precipitation: 24 to 30 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-silty, mixed, active, frigid
 Vitrandic Eutrudepts

Typical Pedon

Tallcreek silt loam, 0 to 4 percent slopes, in an area of forestland, 700 feet south and 1,500 feet east of the northwest corner of sec. 4, T. 26 N., R. 27 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

- A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and many coarse roots; moderately acid; gradual wavy boundary.
- Bw—4 to 18 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; slightly alkaline; gradual wavy boundary.
- Bk—18 to 28 inches; olive gray (5Y 5/2) silt loam, light gray (5Y 7/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few fine masses of lime; slightly effervescent; slightly alkaline; abrupt wavy boundary.
- C1—28 to 34 inches; light olive gray (5Y 6/2) silty clay loam varved lacustrine material, white (5Y 8/2) dry; moderate medium platy structure; slightly hard, friable, moderately sticky, moderately plastic; few medium and coarse roots; slightly effervescent; slightly alkaline; gradual wavy boundary.
- C2—34 to 42 inches; light olive gray (5Y 6/2) silty clay loam varved lacustrine material, white (5Y 8/2) dry; massive; slightly hard, friable, moderately sticky, moderately plastic; slightly effervescent; slightly alkaline; gradual wavy boundary.
- C3—42 to 60 inches; light olive gray (5Y 6/2) very fine sandy loam varved lacustrine material, white (5Y 8/2) dry; massive; slightly hard, very friable, nonsticky, nonplastic; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Moisture control section: Between 4 and 12 inches
Depth to the seasonal high water table: 48 to 72 inches

A horizon

Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 1 or 2
 Clay content: 10 to 25 percent
 Moist bulk density: 1.0 to 1.30 g/cm³
 Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.3 to 1.0 percent
 Volcanic glass component: 20 to 45 percent
 Reaction: pH 5.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 5 to 18 percent

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.3 to 1.0 percent
 Volcanic glass component: 20 to 45 percent
 Reaction: pH 6.1 to 7.8

Bk horizon

Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 1 or 2
 Clay content: 5 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

C horizons

Value: 7 or 8 dry; 6 or 7 moist
 Chroma: 1 or 2
 Texture: Very fine sandy loam, silt loam, or silty clay loam varved lacustrine material
 Clay content: 5 to 32 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

75B—Tallcreek silt loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Elevation: 3,300 to 3,800 feet
Mean annual precipitation: 24 to 30 inches
Frost-free period: 70 to 90 days

Composition**Major Components**

Tallcreek and similar soils: 90 percent

Minor Components

Blackcreek silt loam: 0 to 7 percent
 Slopes greater than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Forestland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 10.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Tamarack Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Stream terraces and outwash plains
Parent material: Volcanic ash over alluvium or outwash
Slope range: 0 to 60 percent
Elevation range: 2,200 to 3,800 feet
Annual precipitation: 24 to 34 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 70 to 90 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Vitrandic Eutrudepts

Typical Pedon

Tamarack loam, 2 to 8 percent slopes, in an area of forestland, 700 feet north and 1,300 feet east of the southwest corner of sec. 11, T. 26 N., R. 27 W.

- Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.
- E—0 to 3 inches; grayish brown (10YR 5/2) loam, light gray (10YR 7/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; moderately acid; clear wavy boundary.
- Bw—3 to 12 inches; dark yellowish brown (10YR 4/4) fine sandy loam, very pale brown (10YR 7/4) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; slightly acid; clear wavy boundary.
- 2E and Bt1—12 to 30 inches; E part (85 percent) is brown (10YR 5/3) loamy sand, very pale brown (10YR 7/3) dry; B part (15 percent) is dark brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry, broken discontinuous lamellae $\frac{1}{8}$ - to $\frac{1}{4}$ -inch thick; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and medium and few coarse roots; moderately acid; gradual wavy boundary.
- 2E and Bt2—30 to 44 inches; E part (80 percent) is brown (10YR 5/3) loamy coarse sand, very pale

brown (10YR 7/3) dry; B part (20 percent) is dark brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry, broken discontinuous lamellae $\frac{1}{4}$ - to $\frac{1}{2}$ -inch thick; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few medium and coarse roots; moderately acid; clear wavy boundary.

2C—44 to 60 inches; brown (10YR 5/3) loamy coarse sand, pale brown (10YR 6/3) dry; single grain; loose, nonsticky, nonplastic; slightly acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 8 and 24 inches

E horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Texture: Loam or fine sandy loam

Clay content: 8 to 20 percent

Moist bulk density: 1.00 to 1.30 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 7.3

Bw horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Clay content: 8 to 20 percent

Moist bulk density: 1.00 to 1.30 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 7.3

2E and Bt horizons

Hue: 10YR or 7.5YR

Value: E part: 6 or 7 dry, 4 or 5 moist; Bt part: 5 or 6 dry, 4 or 5 moist

Clay content: E part: 2 to 8 percent; B part: 5 to 10 percent

Reaction: pH 5.6 to 7.3

2C horizon

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 0 to 8 percent

Reaction: pH 5.6 to 7.3

69C—Tamarack loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tamarack and similar soils: 90 percent

Minor Components

Glaciercreek, cool: 0 to 5 percent

Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

691B—Tamarack-Crystalex complex, 0 to 4 percent slopes

Setting

Landform:

- Tamarack—Stream terraces and outwash plains
- Crystalex—Stream terraces and outwash plains

Position on landform:

- Tamarack—Treads
- Crystalex—Treads

Slope:

- Tamarack—0 to 4 percent
- Crystalex—0 to 4 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tamarack and similar soils: 50 percent

Crystalex and similar soils: 40 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent
 Glaciercreek, cool: 0 to 5 percent

Major Component Description**Tamarack**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.9 inches

Crystalex

Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**691D—Tamarack-Crystalex complex,
4 to 15 percent slopes****Setting***Landform:*

- Tamarack—Stream terraces and outwash plains
- Crystalex—Stream terraces and outwash plains

Position on landform:

- Tamarack—Treads
- Crystalex—Treads

Slope:

- Tamarack—4 to 15 percent
- Crystalex—4 to 15 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Tamarack and similar soils: 50 percent
 Crystalex and similar soils: 40 percent

Minor Components

Glaciercreek, cool: 0 to 4 percent
 Slopes greater than 15 percent: 0 to 3 percent
 Half moon silt loam, cool: 0 to 3 percent

Major Component Description**Tamarack**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over alluvium
 or outwash
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.9 inches

Crystalex

Surface layer texture: Loamy coarse sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**691E—Tamarack-Crystalex complex,
15 to 30 percent slopes****Setting***Landform:*

- Tamarack—Stream terraces and outwash plains
- Crystalex—Stream terraces and outwash plains

Position on landform:

- Tamarack—Dissected or incised treads
- Crystalex—Dissected or incised treads

Slope:

- Tamarack—15 to 30 percent
- Crystalex—15 to 30 percent

Elevation: 3,300 to 3,800 feet*Mean annual precipitation:* 24 to 30 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Tamarack and similar soils: 50 percent

Crystalex and similar soils: 40 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Glaciercreek, cool: 0 to 5 percent

Major Component Description**Tamarack***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over alluvium
or outwash*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.9 inches**Crystalex***Surface layer texture:* Loamy coarse sand*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Alluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

691F—Tamarack-Crystalex complex, 30 to 60 percent slopes

Setting*Landform:*

- Tamarack—Stream terraces and outwash plains
- Crystalex—Stream terraces and outwash plains

Position on landform:

- Tamarack—Risers
- Crystalex—Risers

Slope:

- Tamarack—30 to 60 percent
- Crystalex—30 to 60 percent

Elevation: 3,300 to 3,800 feet*Mean annual precipitation:* 24 to 30 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Tamarack and similar soils: 50 percent

Crystalex and similar soils: 40 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Glaciercreek, cool: 0 to 5 percent

Major Component Description**Tamarack***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over alluvium
or outwash*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.9 inches**Crystalex***Surface layer texture:* Loamy coarse sand*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Alluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

692B—Tamarack fine sandy loam, 0 to 4 percent slopes

Setting*Landform:* Stream terraces*Position on landform:* Treads*Slope:* 0 to 4 percent*Elevation:* 2,200 to 3,800 feet*Mean annual precipitation:* 24 to 34 inches*Frost-free period:* 70 to 90 days

Composition

Major Components

Tamarack and similar soils: 90 percent

Minor Components

Dewberry silt loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 3 percent

Larchpoint silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication

Tevis Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately rapid

Landform: Mountains

Parent material: Colluvium

Slope range: 15 to 70 percent

Elevation: 3,700 to 5,500 feet

Annual precipitation: 23 to 34 inches

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Dystric Eutrudepts

Typical Pedon

Tevis gravelly loam, 35 to 60 percent slopes, in an area of forestland, 1,400 feet south and 1,200 feet east of the northwest corner of sec. 7, T. 18 N., R. 23 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 8 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 4/3) moist; moderate fine

granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 25 percent pebbles; slightly acid; clear smooth boundary.

E/Bw—8 to 21 inches; E part (80 percent) is light gray (10YR 7/2) extremely gravelly loam, grayish brown (10YR 5/2) moist; B part (20 percent) is pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 5 percent cobbles and 60 percent pebbles; neutral; clear smooth boundary.

C—21 to 60 inches; light gray (10YR 7/2) extremely gravelly loam, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 60 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 40 to 46 degrees F

Moisture control section: Between 8 and 24 inches

Note: Some pedons have an E horizon in place of the A horizon.

A horizon

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 15 to 35 percent pebbles

Reaction: pH 5.6 to 7.3

E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: Sandy loam or loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 85 percent—0 to 10 percent cobbles; 60 to 75 percent pebbles

Reaction: pH 5.6 to 7.3

C horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 5 to 10 percent

Content of rock fragments: 60 to 85 percent—0 to 10 percent cobbles; 60 to 75 percent pebbles

Reaction: pH 6.1 to 7.3

30E—Tevis gravelly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 3,700 to 5,500 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Holloway gravelly silt loam: 0 to 5 percent
 Winkler gravelly loam, cool: 0 to 5 percent
 Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

30F—Tevis gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,700 to 5,500 feet
Mean annual precipitation: 28 to 34 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Winkler gravelly loam, cool: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent

Holloway gravelly silt loam: 0 to 3 percent
 Slopes greater than 60 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

30G—Tevis-Rubble land complex, 40 to 70 percent slopes

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 3,700 to 5,500 feet
Mean annual precipitation: 28 to 32 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 60 percent
 Rubble land: 30 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Winkler gravelly loam, cool: 0 to 3 percent
 Mitten gravelly silt loam: 0 to 2 percent

Major Component Description

Tevis

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.9 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

31E—Tevis gravelly loam, dry, 15 to 35 percent slopes

Setting

Landform: Mountains

Slope: 15 to 35 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 23 to 27 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 90 percent

Minor Components

Mitten gravelly silt loam: 0 to 5 percent

Slopes greater than 35 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

31F—Tevis gravelly loam, dry, 35 to 60 percent slopes

Setting

Landform: Mountains

Slope: 35 to 60 percent

Elevation: 4,000 to 5,200 feet

Mean annual precipitation: 23 to 27 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 85 percent

Minor Components

Mitten gravelly silt loam: 0 to 5 percent

Areas of rubble land: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.6 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

441F—Tevis-Rock outcrop complex, 30 to 60 percent slopes

Setting

Landform: Mountains

Slope: 30 to 60 percent

Elevation: 3,600 to 5,000 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Tevis and similar soils: 50 percent

Rock outcrop: 40 percent

Minor Components

Mitten gravelly silt loam: 0 to 5 percent

Slopes greater than 60 percent: 0 to 5 percent

Major Component Description

Tevis

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Totelake Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid to the 2C horizon;
rapid in the 2C horizon

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 2 to 15 percent

Elevation: 2,500 to 3,500 feet

Annual precipitation: 17 to 19 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Haplustepts

Typical Pedon

Totelake gravelly loam, 2 to 8 percent slopes, in an area of forestland, 2,000 feet south and 650 feet west of the northeast corner of sec. 10, T. 18 N., R. 24 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 4 inches; gray (10YR 5/1) gravelly loam, very dark gray (10YR 3/1) moist; weak coarse granular structure; soft, very friable, nonsticky, nonplastic; common very fine and fine roots; 5 percent cobbles and 30 percent pebbles; neutral; clear wavy boundary.

Bw—4 to 21 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

2C—21 to 60 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark grayish

brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few coarse roots; 25 percent cobbles and 50 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 1, 2, or 3

Clay content: 8 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and cobbles; 35 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

2C horizon

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loamy sand or sand

Clay content: 0 to 10 percent

Content of rock fragments: 60 to 80 percent—15 to 25 percent stones and cobbles; 45 to 55 percent pebbles

Reaction: pH 6.6 to 7.8

21B—Totelake gravelly loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 2 to 8 percent

Elevation: 2,500 to 3,500 feet

Mean annual precipitation: 17 to 19 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Totelake and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 5 percent

Bigarm gravelly loam, alluvial: 0 to 4 percent

Areas of riverwash: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

21D—Totelake gravelly loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 8 to 15 percent
Elevation: 2,500 to 3,500 feet
Mean annual precipitation: 17 to 19 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Totelake and similar soils: 90 percent

Minor Components

Slopes greater than 15 percent: 0 to 5 percent
 Bigarm gravelly loam, alluvial: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Upsata Series

Depth class: Very deep
Drainage class: Excessively drained
Permeability: Moderately rapid to 17 inches; very rapid below this depth
Landform: Stream terraces and outwash plains
Parent material: Volcanic ash over alluvium and glacial outwash
Slope range: 2 to 60 percent
Elevation range: 3,300 to 3,800 feet
Annual precipitation: 24 to 30 inches
Annual air temperature: 36 to 40 degrees F
Frost-free period: 40 to 60 days

Taxonomic Class: Sandy-skeletal, mixed Andic Eutrocrypts

Typical Pedon

Upsata gravelly silt loam, 2 to 8 percent slopes, in an area of forestland, 900 feet south and 300 feet east of the northwest corner of sec. 13, T. 26 N., R. 27 W.

- Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.
- E—0 to 2 inches; pinkish gray (7.5YR 6/2) gravelly silt loam, dark brown (7.5YR 4/2) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; 20 percent pebbles; slightly acid; clear wavy boundary.
- Bw—2 to 13 inches; light yellowish brown (10YR 6/4) gravelly silt loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky, and slightly plastic; common fine, medium, and coarse roots; 20 percent pebbles; moderately acid; clear wavy boundary.
- 2BC—13 to 17 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common medium and coarse roots; 5 percent cobbles and 25 percent pebbles; moderately acid; clear wavy boundary.
- 2C1—17 to 35 inches; pinkish gray (7.5YR 7/2) extremely gravelly loamy coarse sand, brown (7.5YR 5/2) moist; massive; loose, nonsticky, nonplastic; common medium roots; 10 percent cobbles and 60 percent pebbles; moderately acid; gradual wavy boundary.
- 2C2—35 to 60 inches; pinkish gray (7.5YR 7/2) extremely gravelly sand, brown (7.5YR 5/2) moist; massive; loose, nonsticky, nonplastic; few

medium roots; 25 percent cobbles and 50 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

Moisture control section: Between 12 and 35 inches

E horizon

Value: 6 or 7 dry; 3, 4, or 5 moist

Clay content: 7 to 15 percent

Content of rock fragments: 0 to 15 percent pebbles

Moist bulk density: 1.0 g/cm³ or less

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: More than 1 percent

Reaction: pH 5.1 to 6.5

Bw horizon

Hue: 10YR or 7.5YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 4, 5, or 6

Clay content: 3 to 7 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 35 percent pebbles

Moist bulk density: 1.0 g/cm³ or less

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: More than 1 percent

Reaction: pH 5.6 to 6.5

2BC horizon

Hue: 2.5YR, 5YR, or 7.5YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 3 to 7 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 35 percent pebbles

Reaction: pH 5.1 to 6.5

2C horizons

Hue: 2.5YR, 5YR, or 7.5YR

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loamy coarse sand, loamy sand, or sand

Clay content: 0 to 5 percent

Content of rock fragments: 80 to 85 percent—15 to 25 percent cobbles; 45 to 60 percent pebbles

Reaction: pH 5.1 to 6.5

68C—Upsata gravelly silt loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Treads

Slope: 2 to 8 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 40 to 60 days

Composition

Major Components

Upsata and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 5 percent

Tamarack loam: 0 to 3 percent

Ashworth gravelly silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

68E—Upsata gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Dissected or incised treads

Slope: 8 to 30 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 40 to 60 days

Composition

Major Components

Upsata and similar soils: 90 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Tamarack loam: 0 to 3 percent

Ashworth gravelly silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

68F—Upsata gravelly silt loam, 30 to 60 percent slopes

Setting

Landform: Stream terraces and outwash plains

Position on landform: Risers

Slope: 30 to 60 percent

Elevation: 3,300 to 3,800 feet

Mean annual precipitation: 24 to 30 inches

Frost-free period: 40 to 60 days

Composition

Major Components

Upsata and similar soils: 90 percent

Minor Components

Slopes greater than 60 percent: 0 to 5 percent

Tamarack loam: 0 to 3 percent

Felan gravelly silt loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Volcanic ash over alluvium or outwash

Flooding: None

Available water capacity: Mainly 3.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Vincom Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow

Landform: Lake plains and terraces

Parent material: Lacustrine deposits

Slope range: 8 to 60 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed, active, calcareous, frigid Typic Xerorthents

Typical Pedon

Vincom silt loam, in an area of Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes, in an area of rangeland, 2,500 feet south and 1,650 feet east of the northwest corner of sec. 25, T. 23 N., R. 24 W.

A—0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic;

many fine and few medium roots; moderately alkaline; clear smooth boundary.

E/Bw—3 to 7 inches; E part (60 percent) is white (10YR 8/2) silt loam, light brownish gray (10YR 6/2) moist; B part (40 percent) is light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common fine roots; moderately alkaline; clear smooth boundary.

Bk—7 to 14 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, moderately plastic; common fine roots; common fine masses and seams of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—14 to 19 inches; white (10YR 8/2) silty clay loam, light gray (10YR 7/2) moist; massive; weak varves $\frac{1}{16}$ - to $\frac{1}{8}$ -inch thick; hard, friable, slightly sticky, moderately plastic; few fine roots; slightly effervescent; strongly alkaline; gradual smooth boundary.

C2—19 to 60 inches; white (10YR 8/2) silty clay loam, light gray (10YR 7/2) moist; massive; distinct varves $\frac{1}{16}$ - to $\frac{1}{8}$ -inch thick; hard, friable, slightly sticky, moderately plastic; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the varved lake sediments: 6 to 22 inches

A horizon

Value: 6 or 7 dry; 4 or 5 moist

Clay content: 15 to 27 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 7.9 to 8.4

E/Bw horizon

Value: E part: 7 or 8 dry, 5 or 6 moist; B part: 6 or 7 dry, 5 or 6 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 7.9 to 8.4

Bk horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 2 to 8 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 8.5 to 9.6

C horizons

Value: 7 or 8 dry; 6 or 7 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 1 to 5 percent

Electrical conductivity (mmhos/cm): 0 to 2

Sodium adsorption ratio: 4 to 13

Reaction: pH 8.5 to 9.6

19F—Vincom silt loam, 35 to 60 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Dissected or incised tread

Slope: 35 to 60 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Vincom and similar soils: 85 percent

Minor Components

Irvine silty clay loam: 0 to 5 percent

Lonepine silt loam: 0 to 5 percent

Areas of lake sediment outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Lacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**119E—Vincom-Lonepine silt loams,
15 to 35 percent slopes****Setting***Landform:*

- Vincom—Lake plains or terraces
- Lonepine—Lake plains or terraces

Position on landform:

- Vincom—Dissected or incised treads
- Lonepine—Dissected or incised treads

Slope:

- Vincom—15 to 35 percent
- Lonepine—15 to 20 percent

Elevation: 2,500 to 3,000 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Vincom and similar soils: 55 percent

Lonepine and similar soils: 30 percent

Minor Components

Irvine silty clay loam: 0 to 9 percent

Round Butte silty clay loam: 0 to 3 percent

Slopes greater than 35 percent: 0 to 3 percent

Major Component Description**Vincom***Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.1 inches**Lonepine***Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**119F—Vincom-Lake sediment outcrop
complex, 35 to 60 percent slopes****Setting***Landform:* Lake plains or terraces*Position on landform:* Dissected or incised treads*Slope:* 35 to 60 percent*Elevation:* 2,500 to 3,000 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Vincom and similar soils: 50 percent

Areas of lake sediment outcrop: 40 percent

Minor Components

Lonepine silt loam: 0 to 5 percent

Irvine silty clay loam: 0 to 5 percent

Major Component Description**Vincom***Surface layer texture:* Silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Lacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.1 inches**Lake sediment outcrop***Definition:* Areas of varved lacustrine deposits.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Waldbillig Series*Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Moraines and mountains*Parent material:* Volcanic ash over till or drift*Slope range:* 4 to 50 percent*Elevation:* 3,800 to 7,000 feet*Annual precipitation:* 30 to 50 inches

Annual air temperature: 37 to 42 degrees F

Frost-free period: 30 to 60 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Andic Eutrocryepts

Typical Pedon

Waldbillig gravelly silt loam, 30 to 50 percent slopes, in an area of forestland, 800 feet north and 100 feet east of the southwest corner of sec. 14, T. 17 N., R. 22 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

Bw—0 to 9 inches; light brown (7.5YR 6/4) gravelly silt loam, brown (10YR 4/4) moist; moderate fine granular structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, medium, and coarse roots; 10 percent cobbles and 15 percent pebbles; slightly acid; gradual smooth boundary.

2E—9 to 15 inches; light gray (10YR 7/2) very gravelly fine sandy loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; common fine and medium roots; 10 percent cobbles and 35 percent pebbles; slightly acid; gradual wavy boundary.

2E/Bw—15 to 60 inches; E part (70 percent) is pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; B part (30 percent) is grayish brown (10YR 5/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots; 5 percent stones, 10 percent cobbles, and 30 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 39 to 44 degrees F

Moisture control section: Between 8 and 24 inches

Thickness of the volcanic ash-influenced layer: 7 to 14 inches

Bw horizon

Hue: 7.5YR or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Moist Bulk Density: 0.95 g/cm³ or less

Reaction: pH 5.6 to 6.5

2E horizon

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 7 to 18 percent

Content of rock fragments: 35 to 60 percent—5 to 10 percent boulders, stones, and cobbles; 30 to 50 percent pebbles

Reaction: pH 5.6 to 6.5

2E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 7 to 18 percent

Content of rock fragments: 35 to 60 percent—5 to 20 percent boulders, stones, and cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

43E—Waldbillig gravelly silt loam, 8 to 30 percent slopes

Setting

Landform: Moraines

Slope: 8 to 30 percent

Elevation: 4,800 to 6,500 feet

Mean annual precipitation: 35 to 45 inches

Frost-free period: 40 to 60 days

Composition

Major Components

Waldbillig and similar soils: 85 percent

Minor Components

Bata gravelly silt loam: 0 to 5 percent

Holloway gravelly silt loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**44D—Waldbillig gravelly silt loam, cool,
4 to 15 percent slopes****Setting***Landform:* Moraines*Slope:* 4 to 15 percent*Elevation:* 5,500 to 7,000 feet*Mean annual precipitation:* 40 to 50 inches*Frost-free period:* 30 to 50 days**Composition****Major Components**

Waldbillig and similar soils: 90 percent

Minor Components

Phillcher gravelly silt loam: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Major Component Description*Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over till or drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.9 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**58F—Waldbillig gravelly silt loam, moist,
30 to 50 percent slopes****Setting***Landform:* Mountains*Slope:* 30 to 50 percent*Elevation:* 3,800 to 5,800 feet*Mean annual precipitation:* 30 to 50 inches*Frost-free period:* 30 to 50 days**Composition****Major Components**

Waldbillig and similar soils: 90 percent

Minor Components

Slopes greater than 50 percent: 0 to 5 percent

Holloway gravelly silt loam: 0 to 4 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description*Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over till or drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**143E—Waldbillig-Holloway gravelly silt
loams, 8 to 30 percent slopes****Setting***Landform:*

• Waldbillig—Moraines

• Holloway—Mountains

Slope:

• Waldbillig—8 to 30 percent

• Holloway—8 to 30 percent

Elevation: 4,800 to 6,500 feet*Mean annual precipitation:* 35 to 45 inches*Frost-free period:* 40 to 60 days**Composition****Major Components**

Waldbillig and similar soils: 45 percent

Holloway and similar soils: 40 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Bata gravelly silt loam: 0 to 5 percent

Waldbillig, bouldery: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description**Waldbillig***Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over till or drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.9 inches

Holloway*Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Volcanic ash over colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

144E—Waldbillig-Holloway gravelly silt loams, cool, 8 to 30 percent slopes**Setting***Landform:*

- Waldbillig—Moraines
- Holloway—Mountains

Slope:

- Waldbillig—8 to 30 percent
- Holloway—8 to 30 percent

Elevation: 5,500 to 7,000 feet*Mean annual precipitation:* 40 to 50 inches*Frost-free period:* 30 to 50 days**Composition****Major Components**

Waldbillig and similar soils: 50 percent

Holloway and similar soils: 35 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Waldbillig, cool, stony: 0 to 4 percent

Areas of rock outcrop: 0 to 4 percent

Waldbillig, cool, bouldery: 0 to 2 percent

Major Component Description**Waldbillig***Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over till or drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 5.9 inches**Holloway***Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Volcanic ash over colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

582E—Waldbillig-Holloway gravelly silt loams, moist, 15 to 30 percent slopes**Setting***Landform:*

- Waldbillig—Mountains
- Holloway—Mountains

Slope:

- Waldbillig—15 to 30 percent
- Holloway—15 to 30 percent

Elevation: 3,800 to 5,800 feet*Mean annual precipitation:* 30 to 50 inches*Frost-free period:* 30 to 50 days**Composition****Major Components**

Waldbillig and similar soils: 50 percent

Holloway and similar soils: 40 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Ashworth gravelly silt loam: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description**Waldbillig***Surface layer texture:* Gravelly silt loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Volcanic ash over till or drift*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 6.0 inches

Holloway

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

582F—Waldbillig-Holloway gravelly silt loams, moist, 30 to 50 percent slopes**Setting**

Landform:
 • Waldbillig—Mountains
 • Holloway—Mountains
Slope:
 • Waldbillig—30 to 50 percent
 • Holloway—30 to 50 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 30 to 50 inches
Frost-free period: 30 to 50 days

Composition**Major Components**

Waldbillig and similar soils: 50 percent
 Holloway and similar soils: 40 percent

Minor Components

Slopes greater than 50 percent: 0 to 4 percent
 Ashworth gravelly silt loam: 0 to 3 percent
 Areas of rock outcrop: 0 to 3 percent

Major Component Description**Waldbillig**

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

Holloway

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Volcanic ash over colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

858E—Waldbillig gravelly silt loam, moist, 8 to 30 percent slopes**Setting**

Landform: Moraines
Slope: 8 to 30 percent
Elevation: 3,800 to 5,800 feet
Mean annual precipitation: 30 to 50 inches
Frost-free period: 30 to 50 days

Composition**Major Components**

Waldbillig and similar soils: 90 percent

Minor Components

Ashworth gravelly silt loam: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.0 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Whitearth Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Slow to 32 inches; moderately slow below this depth

Landform: Alluvial fans and stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation: 2,500 to 3,000 feet

Annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Typic Natrixeralfs

Typical Pedon

Whitearth silt loam, in an area of Whitearth-Slickspots complex, 2 to 8 percent slopes, in an area of rangeland, 2,400 feet south and 1,900 feet west of the northeast corner of sec. 27, T. 23 N., R. 24 W.

E—0 to 7 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, nonplastic; common fine and few medium roots; moderately alkaline; gradual smooth boundary.

Btn—7 to 13 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium angular blocky structure; hard, firm, moderately sticky, slightly plastic; few fine roots; common faint clay films on faces of peds; very strongly alkaline; clear smooth boundary.

Bkn—13 to 32 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few fine roots; disseminated lime; few fine masses of lime; strongly effervescent; very strongly alkaline; gradual smooth boundary.

C—32 to 60 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; soft,

friable, slightly sticky, nonplastic; disseminated lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between 4 and 12 inches

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Electrical conductivity (mmhos/cm): 1 to 2

Sodium adsorption ratio: 5 to 13

Reaction: pH 7.9 to 8.4

Btn horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity (mmhos/cm): 4 to 8

Sodium adsorption ratio: 40 to 60

Reaction: pH 8.5 to 9.6

Bkn horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 3 or 4

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 10 to 15 percent

Electrical conductivity (mmhos/cm): 4 to 8

Sodium adsorption ratio: 40 to 60

Reaction: pH 8.5 to 9.6

C horizon

Value: 7 or 8 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity (mmhos/cm): 4 to 16

Sodium adsorption ratio: 60 to 75

Reaction: pH 8.5 to 9.6

5B—Whitearth silt loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Whitearth and similar soils: 90 percent

Minor Components

Areas of slickspots: 0 to 6 percent

Sonyok silty clay loam: 0 to 2 percent

Slopes greater than 4 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**105B—Whitearth-Slickspots complex,
2 to 8 percent slopes****Setting**

Landform: Alluvial fans and stream terraces

Slope: 2 to 8 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Whitearth and similar soils: 65 percent

Areas of slickspots: 25 percent

Minor Components

Marklepass silty clay loam: 0 to 5 percent

Slopes greater than 8 percent: 0 to 4 percent

Sonyok silty clay loam: 0 to 1 percent

Major Component Description**Whitearth**

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.3 inches

Slickspots

Definition: Areas of loamy or clayey soil with excess exchangeable sodium and low productivity.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Whitepine Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Very slow

Landform: Lake plains and terraces

Parent material: Glaciolacustrine deposits

Slope range: 0 to 35 percent

Elevation range: 2,300 to 2,800 feet

Annual precipitation: 24 to 28 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 115 days

Taxonomic Class: Fine, mixed, active, frigid Vitrandic Hapludalfs

Typical Pedon

Whitepine silt loam, 0 to 4 percent slopes, in an area of forestland, 1,700 feet north and 1,000 feet west of the southeast corner of sec. 5, T. 22 N., R. 30 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; slightly acid; abrupt wavy boundary.

E—1 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many fine and medium and common coarse roots; neutral; gradual wavy boundary.

E/Bt—8 to 14 inches; E part (60 percent) is brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; B part (40 percent) is brown (7.5YR 5/4) silty clay, light brown (7.5YR 6/4) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common medium and coarse roots; common distinct clay

films on faces of peds; slightly acid; clear wavy boundary.

Bt/E—14 to 28 inches; B part (80 percent) is brown (7.5YR 5/4) clay, light brown (7.5YR 6/4) dry; E part (20 percent) is brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; strong medium subangular blocky structure; very hard, firm, very sticky, very plastic; common medium and coarse roots; many distinct clay films on faces of peds; slightly acid; gradual wavy boundary.

C—28 to 60 inches; brown (7.5YR 5/4) clay, light brown (7.5YR 6/4) dry; massive; $\frac{1}{16}$ - to $\frac{1}{2}$ -inch thick varves of stratified silt loam, silty clay loam and clay; hard, firm, very sticky, very plastic; few medium and coarse roots; moderately acid.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Clay content: 10 to 15 percent

Moist bulk density: 1.0 to 1.40 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 7.3

E horizon

Value: 6 or 7 dry; 5 or 6 moist

Clay content: 10 to 15 percent

Moist bulk density: 1.0 to 1.40 g/cm³

Acid oxalate extractable Al + $\frac{1}{2}$ Fe: 0.4 to 1.0 percent

Reaction: pH 5.6 to 7.3

E/Bt horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 6 or 7 dry, 4 or 5 moist

Clay content: E part: 15 to 25 percent; B part: 40 to 60 percent

Reaction: pH 5.6 to 7.3

Bt/E horizon

Hue: B part: 10YR, 7.5YR, or 5YR; E part: 10YR

Value: B part: 5, 6, or 7 dry, 4, 5, or 6 moist;

E part: 6 or 7 dry, 4 or 5 moist

Clay content: B part: 40 to 60 percent; E part: 20 to 27 percent

Reaction: pH 5.6 to 7.3

C horizon

Hue: 10YR, 7.5YR, or 5YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Texture: Clay, silt loam, or silty clay loam

Clay content: 18 to 60 percent

Reaction: pH 5.6 to 7.3

85B—Whitepine silt loam, 0 to 4 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Treads

Slope: 0 to 4 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Whitepine and similar soils: 85 percent

Minor Components

Lionwood loam: 0 to 5 percent

Scotmont fine sandy loam: 0 to 5 percent

Slopes greater than 4 percent: 0 to 4 percent

Iffgulch and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

85D—Whitepine silt loam, 4 to 15 percent slopes

Setting

Landform: Lake plains or terraces

Position on landform: Treads

Slope: 4 to 15 percent

Elevation: 2,300 to 2,800 feet

Mean annual precipitation: 24 to 28 inches

Frost-free period: 100 to 115 days

Composition

Major Components

Whitepine and similar soils: 85 percent

Minor Components

Scotmont fine sandy loam: 0 to 9 percent

Slopes greater than 15 percent: 0 to 3 percent

Beaverdump gravelly loam: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 9.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Wildgen Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines and mountains

Parent material: Alpine till and drift derived from argillite and quartzite

Slope range: 4 to 50 percent

Elevation: 3,000 to 5,200 feet

Annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Haplustepts

Typical Pedon

Wildgen gravelly loam, 30 to 50 percent slopes, in an area of forestland, 3,600 feet south and 2,400 feet east of the northwest corner of sec. 14, T. 17 N., R. 22 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

A—0 to 7 inches; light grayish brown (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2)

moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, medium, and coarse roots; 5 percent cobbles and 20 percent pebbles; slightly acid; gradual smooth boundary.

E—7 to 22 inches; light gray (10YR 7/2) very gravelly loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky, slightly plastic; common very fine, fine, medium, and coarse roots; 15 percent cobbles and 35 percent pebbles; neutral; gradual wavy boundary.

E/Bw—22 to 60 inches; E part (60 percent) is very pale brown (10YR 7/3) very gravelly sandy loam, brown (10YR 5/3) moist; B part (40 percent) is grayish brown (10YR 5/2) very gravelly loam, brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots; 15 percent cobbles and 40 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between 4 and 12 inches

A horizon

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Clay content: 15 to 25 percent

Content of rock fragments: 20 to 35 percent—0 to 5 percent cobbles; 20 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 60 percent—0 to 20 percent stones and cobbles; 35 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

E/Bw horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 10 to 25 percent

Content of rock fragments: 40 to 60 percent—0 to 20 percent stones and cobbles; 35 to 40 percent pebbles

Reaction: pH 6.1 to 7.3

25D—Wildgen gravelly loam, 4 to 15 percent slopes

Setting

Landform: Moraines
Slope: 4 to 15 percent
Elevation: 3,000 to 5,200 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Winkler gravelly loam: 0 to 5 percent
 Combust gravelly silt loam: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

25E—Wildgen gravelly loam, 15 to 30 percent slopes

Setting

Landform: Moraines
Slope: 15 to 30 percent
Elevation: 3,200 to 5,200 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Slopes greater than 30 percent: 0 to 6 percent
 Combust gravelly silt loam: 0 to 5 percent
 Winkler gravelly loam: 0 to 4 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

25F—Wildgen gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,200 to 5,200 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Combust gravelly silt loam: 0 to 5 percent
 Rock outcrop: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 3 percent
 Winkler gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

27D—Wildgen gravelly loam, dry, 4 to 15 percent slopes

Setting

Landform: Moraines

Slope: 4 to 15 percent

Elevation: 3,000 to 4,200 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Winkler gravelly loam, cool: 0 to 5 percent

Slopes greater than 15 percent: 0 to 5 percent

Winfall gravelly loam: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

27E—Wildgen gravelly loam, dry, 15 to 30 percent slopes

Setting

Landform: Moraines

Slope: 15 to 30 percent

Elevation: 3,200 to 4,800 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Winkler gravelly loam, cool: 0 to 5 percent

Winfall gravelly loam: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

27F—Wildgen gravelly loam, dry, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 3,200 to 4,800 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Wildgen and similar soils: 85 percent

Minor Components

Winkler gravelly loam, cool: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Slopes greater than 50 percent: 0 to 3 percent

Areas of rubble land: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winfall Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Moraines and mountains

Parent material: Alpine till and drift derived from argillite and quartzite

Slope range: 8 to 60 percent

Elevation: 3,900 to 5,500 feet

Annual precipitation: 24 to 34 inches

Annual air temperature: 38 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lamellic Eutrudepts

Typical Pedon

Winfall gravelly loam, 8 to 30 percent slopes, in an area of forestland, 2,000 feet north and 2,000 feet east of the southwest corner of sec. 18, T. 17 N., R. 21 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

E—0 to 8 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak coarse granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 30 percent pebbles; slightly acid; clear smooth boundary.

E/Bw—8 to 60 inches; E part (60 percent) is light brownish gray (10YR 6/2) very gravelly loam, grayish brown (10YR 5/2) moist; B part (40 percent) is yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, and medium

and few coarse roots; 5 percent cobbles and 40 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 8 and 24 inches

E horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 5.1 to 6.5

E/Bw horizon

Value: E part: 6 or 7 dry, 5 or 6 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: E part: 2 or 3; B part: 3 or 4

Texture: Loam or sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles

Reaction: pH 5.1 to 6.5

34E—Winfall gravelly loam, 8 to 30 percent slopes

Setting

Landform: Moraines

Slope: 8 to 30 percent

Elevation: 4,000 to 5,500 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 85 percent

Minor Components

Waldbillig gravelly silt loam: 0 to 5 percent

Courville gravelly silt loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 4 percent

Tevis gravelly loam: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

34F—Winfall gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 4,000 to 5,500 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 85 percent

Minor Components

Courville gravelly silt loam: 0 to 5 percent

Tevis gravelly loam: 0 to 5 percent

Areas of rubble land: 0 to 3 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

134E—Winfall-Courville complex, 8 to 30 percent slopes

Setting

Landform:

- Winfall—Moraines

- Courville—Moraines

Slope:

- Winfall—8 to 30 percent

- Courville—8 to 30 percent

Elevation: 4,200 to 5,500 feet

Mean annual precipitation: 26 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 50 percent

Courville and similar soils: 35 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 4 percent

Winfall gravelly loam, dry: 0 to 3 percent

Tevis gravelly loam: 0 to 3 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Courville

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

138E—Winfall-Courville complex, dry, 8 to 30 percent slopes

Setting

Landform:

- Winfall—Moraines
- Courville—Moraines

Slope:

- Winfall—8 to 30 percent
- Courville—8 to 30 percent

Elevation: 4,000 to 5,000 feet

Mean annual precipitation: 24 to 26 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 50 percent

Courville and similar soils: 35 percent

Minor Components

Slopes greater than 30 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 4 percent

Tevis gravelly loam, dry: 0 to 3 percent

Wildgen gravelly loam, dry: 0 to 3 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

Courville

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

522F—Winfall-Courville complex, 30 to 60 percent slopes

Setting

Landform:

- Winfall—Mountains
- Courville—Mountains

Slope:

- Winfall—30 to 60 percent
- Courville—30 to 60 percent

Elevation: 3,900 to 5,500 feet

Mean annual precipitation: 28 to 34 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winfall and similar soils: 55 percent

Courville and similar soils: 35 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Winfall gravelly loam, dry: 0 to 5 percent

Major Component Description

Winfall

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.5 inches

Courville

Surface layer texture: Gravelly silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Volcanic ash over till or drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Winkler Series*Depth class:* Very deep*Drainage class:* Somewhat excessively drained*Permeability:* Moderately rapid*Landform:* Mountains*Parent material:* Colluvium derived from argillite and quartzite*Slope range:* 8 to 70 percent*Elevation:* 2,800 to 5,200 feet*Annual precipitation:* 18 to 22 inches*Annual air temperature:* 38 to 45 degrees F*Frost-free period:* 70 to 90 days**Taxonomic Class:** Loamy-skeletal, mixed, superactive, frigid Lamellic Haplustepts**Typical Pedon**

Winkler gravelly loam, 35 to 60 percent slopes, in an area of forestland, 800 feet north and 2,000 feet east of the southwest corner of sec. 32, T. 23 N., R. 24 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak coarse granular structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and common coarse roots; 5 percent cobbles and 25 percent pebbles; neutral; clear smooth boundary.

E—4 to 22 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; common very fine, fine, medium, and coarse roots; 10 percent cobbles and 60 percent pebbles; neutral; gradual wavy boundary.

E/Bw—22 to 60 inches; E part (80 percent) is light yellowish brown (10YR 6/4) extremely gravelly sandy loam, brown (10YR 4/3) moist; B part (20 percent) is yellowish brown (10YR 5/4) extremely gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; few medium roots; 20 percent cobbles and 60 percent pebbles; slightly acid.

Range in Characteristics*Soil temperature:* 42 to 47 degrees F*Moisture control section:* Between 8 and 24 inches*Note:* Some pedons have a C horizon below the E/Bw.**A horizon**

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 6.1 to 7.3

E horizon

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 35 to 70 percent—0 to 10 percent cobbles; 35 to 60 percent pebbles

Reaction: pH 5.6 to 7.3

E/Bw horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or loam

Clay content: 5 to 15 percent

Content of rock fragments: 60 to 85 percent—10 to 25 percent cobbles; 50 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

**20E—Winkler gravelly loam,
15 to 35 percent slopes****Setting***Landform:* Mountains*Slope:* 15 to 35 percent*Elevation:* 3,200 to 4,800 feet*Mean annual precipitation:* 18 to 20 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Winkler and similar soils: 85 percent

Minor Components

Slopes greater than 35 percent: 0 to 5 percent

Winkler gravelly loam, cool: 0 to 4 percent

Wildgen gravelly loam: 0 to 3 percent

Sharrott gravelly loam: 0 to 2 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

20F—Winkler gravelly loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 3,200 to 4,800 feet
Mean annual precipitation: 18 to 20 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Areas of rubble land: 0 to 5 percent
 Winkler gravelly loam, cool: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

20G—Winkler-Rubble land complex, 40 to 70 percent slopes

Setting

Landform: Mountains
Slope: 40 to 70 percent
Elevation: 3,500 to 5,200 feet
Mean annual precipitation: 18 to 20 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 55 percent
 Rubble land: 30 percent

Minor Components

Sharrott gravelly loam: 0 to 4 percent
 Areas of rock outcrop: 0 to 4 percent
 Winkler gravelly loam, cool: 0 to 4 percent
 Slopes less than 40 percent: 0 to 3 percent

Major Component Description

Winkler

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.8 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**22E—Winkler gravelly sandy loam, cool,
15 to 35 percent slopes****Setting***Landform:* Mountains*Slope:* 15 to 35 percent*Elevation:* 3,500 to 5,200 feet*Mean annual precipitation:* 19 to 21 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Winkler and similar soils: 85 percent

Minor Components

Winkler gravelly loam: 0 to 5 percent

Wildgen gravelly loam: 0 to 4 percent

Slopes greater than 35 percent: 0 to 3 percent

Sharrott gravelly loam, cool: 0 to 2 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description*Surface layer texture:* Gravelly sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**22F—Winkler gravelly sandy loam, cool,
35 to 60 percent slopes****Setting***Landform:* Mountains*Slope:* 35 to 60 percent*Elevation:* 3,500 to 5,200 feet*Mean annual precipitation:* 19 to 21 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Winkler and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Areas of rubble land: 0 to 4 percent

Winkler gravelly loam: 0 to 4 percent

Sharrott gravelly loam, cool: 0 to 2 percent

Major Component Description*Surface layer texture:* Gravelly sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.5 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

**22G—Winkler, cool-Rubble land complex,
40 to 70 percent slopes****Setting***Landform:* Mountains*Slope:* 40 to 70 percent*Elevation:* 3,500 to 5,200 feet*Mean annual precipitation:* 19 to 21 inches*Frost-free period:* 70 to 90 days**Composition****Major Components**

Winkler and similar soils: 60 percent

Rubble land: 25 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Sharrott gravelly loam, cool: 0 to 5 percent

Winkler gravelly loam: 0 to 5 percent

Major Component Description**Winkler***Surface layer texture:* Gravelly sandy loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Somewhat excessively drained*Dominant parent material:* Colluvium*Native plant cover type:* Forestland*Flooding:* None*Available water capacity:* Mainly 3.5 inches

Rubble land

Definition: Areas covered by stones or boulders that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

120G—Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes**Setting**

Landform:

- Winkler—Mountains
- Sharrott—Mountains

Slope:

- Winkler—40 to 70 percent
- Sharrott—40 to 85 percent

Elevation: 3,200 to 4,800 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Winkler and similar soils: 40 percent

Sharrott and similar soils: 30 percent

Rubble land: 15 percent

Minor Components

Slopes less than 40 percent: 0 to 5 percent

Areas of rock outcrop: 0 to 5 percent

Winkler gravelly loam, cool: 0 to 5 percent

Major Component Description**Winkler**

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.8 inches

Sharrott

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.2 inches

Rubble land

Definition: Areas covered by stones or boulders that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

122E—Winkler, cool-Sharrott, cool-Rock outcrop complex, 8 to 40 percent slopes**Setting**

Landform:

- Winkler—Mountains
- Sharrott—Mountains

Slope:

- Winkler—8 to 40 percent
- Sharrott—8 to 40 percent

Elevation: 3,500 to 4,000 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition**Major Components**

Winkler and similar soils: 40 percent

Sharrott and similar soils: 25 percent

Rock outcrop: 25 percent

Minor Components

Areas of rubble land: 0 to 4 percent

Slopes greater than 40 percent: 0 to 3 percent

Winkler gravelly loam: 0 to 3 percent

Major Component Description**Winkler**

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.5 inches

Sharrott

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.1 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

122G—Winkler, cool-Sharrott, cool-Rubble land complex, 40 to 85 percent slopes

Setting

Landform:

- Winkler—Mountains
- Sharrott—Mountains

Slope:

- Winkler—40 to 70 percent
- Sharrott—40 to 85 percent

Elevation: 3,200 to 5,200 feet

Mean annual precipitation: 19 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 55 percent

Sharrott and similar soils: 20 percent

Rubble land: 15 percent

Minor Components

Areas of rock outcrop: 0 to 4 percent

Slopes less than 40 percent: 0 to 3 percent

Winkler gravelly loam: 0 to 3 percent

Major Component Description

Winkler

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Sharrott

Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.1 inches

Rubble land

Definition: Areas covered by boulders or stones that support little or no vegetation.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

532E—Winkler-Sharrott-Rock outcrop complex, 8 to 40 percent slopes

Setting

Landform:

- Winkler—Mountains
- Sharrott—Mountains

Slope:

- Winkler—8 to 40 percent
- Sharrott—8 to 40 percent

Elevation: 2,800 to 4,200 feet

Mean annual precipitation: 18 to 20 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Winkler and similar soils: 40 percent

Sharrott and similar soils: 25 percent

Rock outcrop: 20 percent

Minor Components

Areas of rubble land: 0 to 5 percent

Slopes greater than 40 percent: 0 to 5 percent

Winkler gravelly loam, cool: 0 to 5 percent

Major Component Description

Winkler

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 3.2 inches

Sharrott

Surface layer texture: Gravelly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 1.2 inches

Rock outcrop

Definition: Exposures of argillite and quartzite.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yellowbay Series

Depth class: Very deep

Drainage class: Excessively drained

Permeability: Moderately rapid to 17 inches; rapid below this depth

Landform: Stream terraces and escarpments

Parent material: Alluvium

Slope range: 2 to 30 percent

Elevation range: 2,300 to 3,600 feet

Annual precipitation: 15 to 24 inches

Annual air temperature: 39 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Haploxerepts

Typical Pedon

Yellowbay gravelly loam, 2 to 8 percent slopes, in an area of forestland, 2,500 feet south and 2,200 feet west of the northeast corner of sec. 31, T. 21 N., R. 27 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter.

A—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 20 percent pebbles; moderately acid; abrupt smooth boundary.

Bw—2 to 17 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many very fine, fine, and medium roots; 40 percent pebbles; moderately acid; clear wavy boundary.

BC—17 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky, nonplastic; few very fine, fine, and medium roots; 5 percent cobbles and 70 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 12 and 35 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 35 percent pebbles

Reaction: pH 5.6 to 7.3

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 5 to 10 percent

Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles

Reaction: pH 5.6 to 7.3

BC horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Clay content: 2 to 5 percent

Content of rock fragments: 60 to 80 percent—0 to 10 percent cobbles; 60 to 70 percent pebbles

Reaction: pH 5.6 to 7.3

54C—Yellowbay gravelly loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 2 to 8 percent
Elevation: 2,400 to 3,600 feet
Mean annual precipitation: 18 to 20 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Yellowbay and similar soils: 90 percent

Minor Components

Beaverdump gravelly loam: 0 to 5 percent
 Slopes greater than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

541C—Yellowbay gravelly loam, moist, 2 to 8 percent slopes

Setting

Landform: Stream terraces
Position on landform: Treads
Slope: 2 to 8 percent
Elevation: 2,300 to 2,600 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Yellowbay and similar soils: 90 percent

Minor Components

Slopes greater than 8 percent: 0 to 5 percent
 Yellowbay cobbly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

542F—Yellowbay-Selon-Bemishave complex, 15 to 60 percent slopes

Setting

Landform:

- Yellowbay—Escarpments
- Selon—Escarpments
- Bemishave—Escarpments

Position on landform:

- Yellowbay—Backslopes
- Selon—Backslopes, footslopes, and side slopes
- Bemishave—Footslopes

Slope:

- Yellowbay—15 to 30 percent
- Selon—15 to 60 percent
- Bemishave—15 to 35 percent

Elevation: 2,400 to 2,700 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Yellowbay and similar soils: 40 percent
 Selon and similar soils: 30 percent
 Bemishave and similar soils: 15 percent

Minor Components

Slopes greater than 60 percent: 0 to 8 percent
 Bigarm, alluvial: 0 to 7 percent

Major Component Description

Yellowbay

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.4 inches

Selon

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.1 inches

Bemishave

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 10.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

543F—Yellowbay-Selon-Sacheen complex, 15 to 60 percent slopes

Setting

Landform:

- Yellowbay—Escarpments
- Selon—Escarpments
- Sacheen—Escarpments

Slope:

- Yellowbay—15 to 30 percent
 - Selon—15 to 60 percent
 - Sacheen—15 to 60 percent
- Elevation:* 2,400 to 2,800 feet
Mean annual precipitation: 16 to 20 inches
Frost-free period: 100 to 115 days

Composition

Major Components

Yellowbay and similar soils: 40 percent
 Selon and similar soils: 30 percent
 Sacheen and similar soils: 20 percent

Minor Components

Slopes greater than 60 percent: 0 to 4 percent
 Bemishave loam: 0 to 3 percent
 Winkler gravelly loam, cool: 0 to 3 percent

Major Component Description

Yellowbay

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.4 inches

Selon

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.1 inches

Sacheen

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

Yourame Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderately slow

Landform: Moraines, mountain slopes, stream terraces, and alluvial fans

Parent material: Glacial till and drift derived from argillite and quartzite

Slope range: 0 to 50 percent

Elevation: 3,000 to 5,000 feet

Annual precipitation: 17 to 22 inches

Annual air temperature: 38 to 44 degrees F

Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Yourame gravelly loam, 4 to 15 percent slopes, in an area of forestland, 500 feet north and 2,200 feet east of the southwest corner of sec. 4, T. 21 N., R. 29 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter.

E1—0 to 5 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parting to moderate fine and medium granular; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 5 percent cobbles and 25 percent pebbles; neutral; clear wavy boundary.

E2—5 to 11 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many very fine, fine, and medium and few coarse roots; 5 percent cobbles and 25 percent pebbles; neutral; clear wavy boundary.

E/Bt—11 to 17 inches; E part (70 percent) is very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; B part (30 percent) is very pale brown (10YR 7/4) gravelly loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly

sticky, slightly plastic; common very fine, fine, and medium and few coarse roots; many distinct clay films on faces of peds; 5 percent cobbles and 25 percent pebbles; neutral; clear wavy boundary.

Bt—17 to 34 inches; very pale brown (10YR 7/4) very gravelly clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine, fine, medium, and coarse roots; many distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; neutral; gradual wavy boundary.

Bk—34 to 60 inches; very pale brown (10YR 8/3) very gravelly clay loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure; hard, very friable, moderately sticky, moderately plastic; few very fine, fine, medium, and coarse roots; 15 percent cobbles and 40 percent pebbles; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between 4 and 12 inches

Depth to the Bk horizon: 30 to 60 inches

E horizons

Value: 6 or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles

Reaction: pH 5.6 to 7.3

E/Bt horizon

Value: E part: 6 or 7 dry, 4 or 5 moist; B part: 5, 6, or 7 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 7 to 15 percent

Content of rock fragments: 15 to 35 percent—0 to 10 percent cobbles; 15 to 25 percent pebbles

Reaction: pH 5.6 to 7.3

Bt horizon

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or loam

Clay content: 20 to 35 percent

Content of rock fragments: 35 to 60 percent—5 to 20 percent cobbles; 30 to 40 percent pebbles

Reaction: pH 5.6 to 7.3

Bk horizon

Value: 6, 7, or 8 dry; 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 18 to 30 percent
 Content of rock fragments: 35 to 60 percent—5 to 20 percent cobbles; 30 to 40 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

23D—Yourame gravelly loam, 4 to 15 percent slopes

Setting

Landform: Moraines
Slope: 4 to 15 percent
Elevation: 3,000 to 4,500 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 85 percent

Minor Components

Bignell gravelly loam: 0 to 5 percent
 Slopes greater than 15 percent: 0 to 5 percent
 Yourame gravelly loam, dry: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

23E—Yourame gravelly loam, 15 to 30 percent slopes

Setting

Landform: Moraines
Slope: 15 to 30 percent
Elevation: 3,000 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Slopes greater than 30 percent: 0 to 5 percent
 Yourame gravelly loam, dry: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

23F—Yourame gravelly loam, 30 to 50 percent slopes

Setting

Landform: Mountains
Slope: 30 to 50 percent
Elevation: 3,000 to 5,000 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Slopes greater than 50 percent: 0 to 5 percent
 Yourame gravelly loam, dry: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till or glacial drift
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

29E—Yourame gravelly loam, dry, 15 to 30 percent slopes

Setting

Landform: Moraines

Slope: 15 to 30 percent

Elevation: 3,000 to 4,500 feet

Mean annual precipitation: 17 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 85 percent

Minor Components

Eaglewing gravelly loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Yourame gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

29F—Yourame gravelly loam, dry, 30 to 50 percent slopes

Setting

Landform: Mountains

Slope: 30 to 50 percent

Elevation: 3,000 to 4,500 feet

Mean annual precipitation: 17 to 21 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 85 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent

Slopes greater than 50 percent: 0 to 5 percent

Yourame gravelly loam: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.4 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

55B—Yourame gravelly loam, 0 to 4 percent slopes

Setting

Landform: Terraces and alluvial fans

Slope: 0 to 4 percent

Elevation: 3,000 to 3,500 feet

Mean annual precipitation: 20 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 90 percent

Minor Components

Slopes greater than 4 percent: 0 to 5 percent

Rumblecreek gravelly loam: 0 to 3 percent

Bignell gravelly loam: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.8 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

123D—Yourame-Wildgen gravelly loams, 8 to 30 percent slopes

Setting

Landform:

- Yourame—Moraines
- Wildgen—Moraines

Slope:

- Yourame—8 to 30 percent
- Wildgen—8 to 30 percent

Elevation: 3,000 to 4,500 feet

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 90 days

Composition

Major Components

Yourame and similar soils: 45 percent

Wildgen and similar soils: 40 percent

Minor Components

Winkler gravelly loam: 0 to 5 percent

Slopes greater than 30 percent: 0 to 5 percent

Yourame gravelly loam, dry: 0 to 5 percent

Major Component Description

Yourame

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.8 inches

Wildgen

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alpine till or glacial drift

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 5.3 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Management

For management information about this map unit, see appropriate sections in Part II of this publication.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited.

Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser

depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material.

Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties

include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding

lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. (See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II).

The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the

soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These

changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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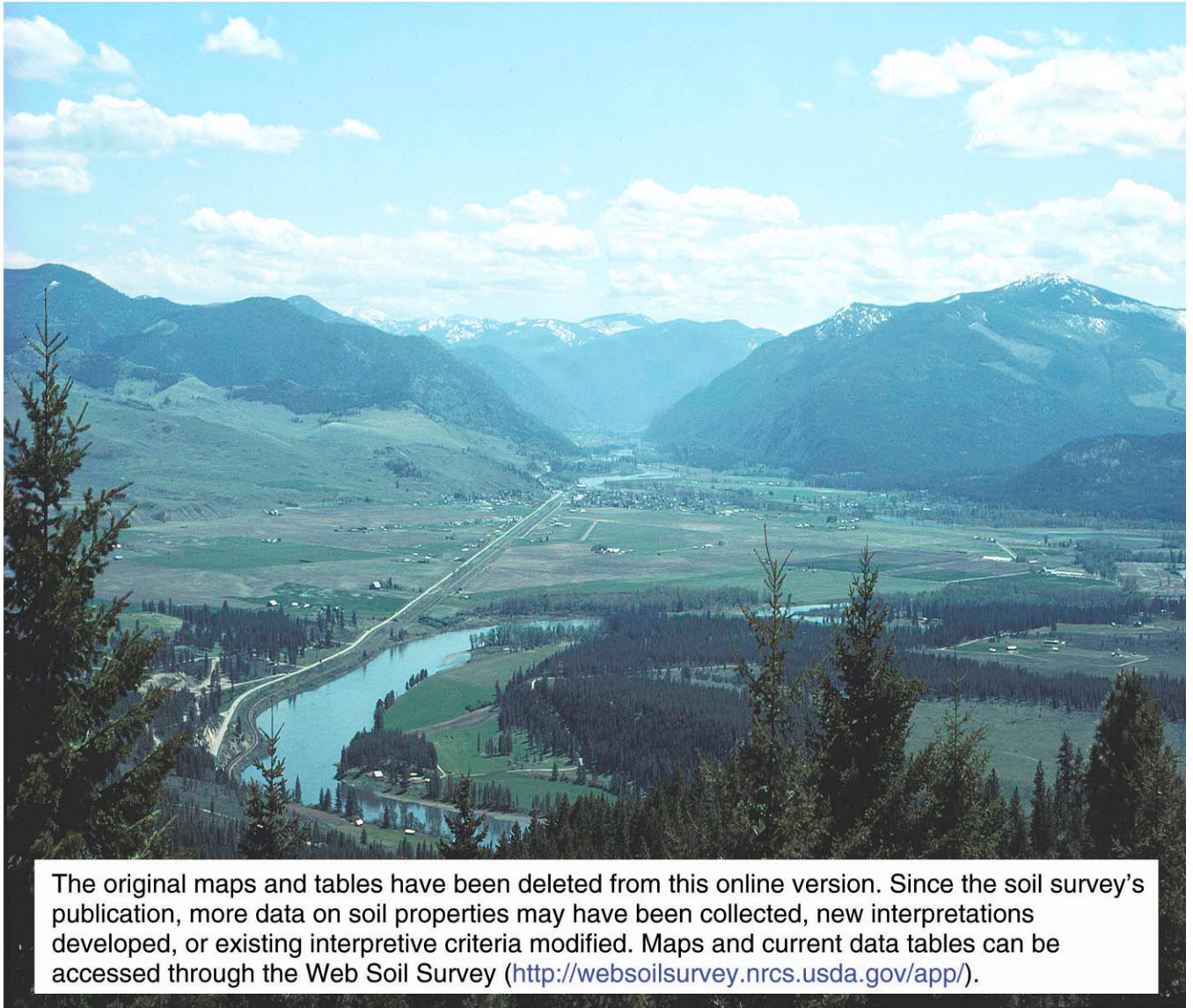
Natural
Resources
Conservation
Service



In cooperation with the
United States Department
of the Interior, Bureau of
Indian Affairs, and
Montana Agricultural
Experiment Station

MT651—Soil Survey of Sanders and Parts of Lincoln and Flathead Counties, Montana

Part II



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How to Use This Soil Survey

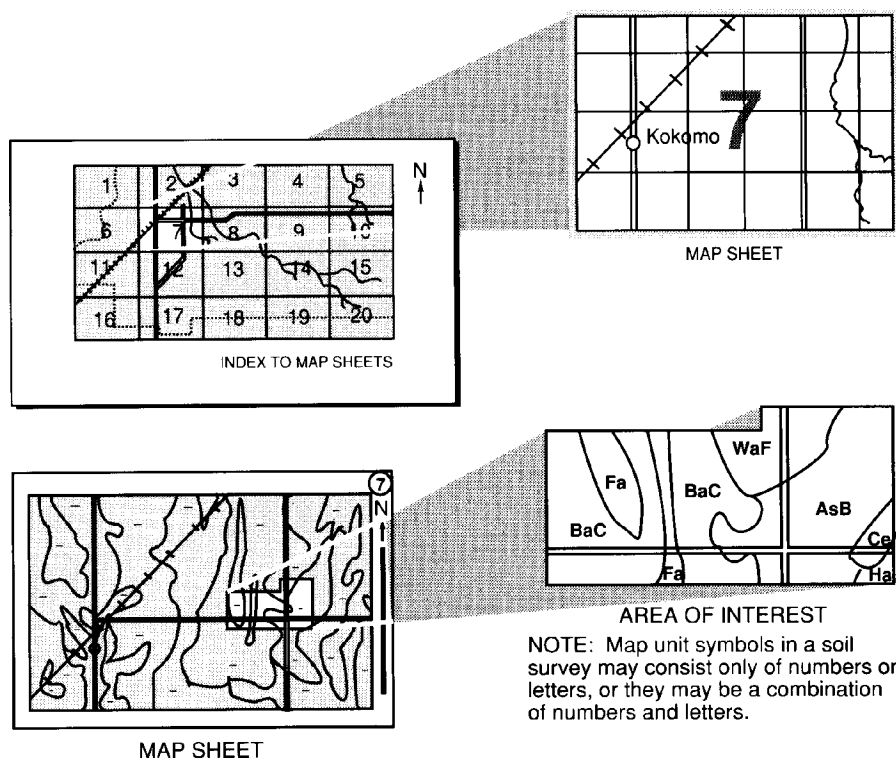
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (<http://websoilsurvey.nrcs.usda.gov/app/>).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

See the Contents for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1996. This survey was made cooperatively by the Natural Resources Conservation Service; the United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Eastern Sanders County Conservation District; the Green Mountain Conservation District; the Flathead Conservation District; the Lincoln Conservation District; and the United States Department of the Interior, Bureau of Indian Affairs. Financial assistance was provided by the United States Department of the Interior, Bureau of Indian Affairs.

The most current official data are available through the NRCS Soil Data Mart website at <http://soildatamart.nrcs.usda.gov>. Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: View of the Clark Fork River Valley looking southeast toward the town of Plains.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

Contents

Part I

How to Use This Soil Survey	i
Index to Taxonomic Units	xiv
Index to Map Units	xvi
Summary of Tables	xxv
Foreword	xxvii
General Nature of the Survey Area	1
History	1
Industry, Transportation, and Recreation	2
Physiography, Drainage, and Geology	3
Mineral and Ground-Water Resources	7
Geothermal Resources and Seismic Activity	9
Climate	9
How This Survey Was Made	10
Formation and Classification of the Soils	17
Formation of the Soils	17
Climate	17
Living Organisms	17
Topography	17
Parent Material	18
Time	18
Classification of the Soils	18
Soil Series and Detailed Map Units	31
References	279
Glossary	281

Part II

How To Use This Soil Survey	i
Detailed Soil Map Unit Legend	iv
Summary of Tables	xii
Agronomy	13
Cropland Limitations and Hazards	14

Crop Yield Estimates	15
Pasture and Hayland Management	16
Land Capability Classification	16
Prime Farmland and Other Important	
Farmland	17
Erosion Factors	18
Range	81
Similarity Index	82
Rangeland Management	82
Understory Management	83
Forestland	181
Woodland Ordination System	182
Forestland Management and Productivity	183
Main Forest Access Road Limitations and	
Hazards	184
Recreation	251
Wildlife Habitat	287
Elements of Wildlife Habitat	287
Kinds of Wildlife Habitat	287
Wildlife of Sanders and Parts of Lincoln and	
Flathead Counties	288
Engineering	291
Building Site Development	291
Sanitary Facilities	292
Waste Management	293
Construction Materials	294
Water Management	295
Soil Properties	441
Engineering Index Properties	441
Physical and Chemical Properties	442
Water Features	444
Soil Features	445
References	673
Glossary	675

Detailed Soil Map Unit Legend

- 1A—Grantsdale silt loam, 0 to 4 percent slopes
- 2B—Moiese gravelly loam, 0 to 4 percent slopes
- 3A—Gird silt loam, 0 to 4 percent slopes
- 3B—Gird silt loam, 4 to 8 percent slopes
- 4A—Lamoose loam, moist, 0 to 2 percent slopes
- 5B—Whitearth silt loam, 0 to 4 percent slopes
- 6A—Murrstead mucky peat, 0 to 2 percent slopes
- 6B—Sacheen loamy fine sand, dry, 2 to 8 percent slopes
- 6E—Sacheen loamy fine sand, dry, 8 to 30 percent slopes
- 7B—Jocko gravelly loam, 0 to 4 percent slopes
- 8A—Hewolf gravelly loam, 0 to 2 percent slopes
- 9A—Lamoose silt loam, 0 to 2 percent slopes
- 10A—Bohnlly silt loam, 0 to 2 percent slopes
- 11A—Bolack silt loam, 0 to 2 percent slopes
- 12A—Marklepass silty clay loam, 0 to 2 percent slopes
- 12C—Auggie silt loam, 2 to 8 percent slopes
- 12E—Auggie silt loam, 8 to 30 percent slopes
- 13A—Round Butte silty clay loam, 0 to 2 percent slopes
- 13B—Round Butte silty clay loam, 2 to 8 percent slopes
- 14A—Belton silt loam, 0 to 2 percent slopes
- 14B—Belton silt loam, 2 to 8 percent slopes
- 14D—Belton silt loam, 8 to 15 percent slopes
- 14E—Belton silt loam, 15 to 35 percent slopes
- 15B—Lonepine silt loam, 2 to 8 percent slopes
- 15D—Lonepine-Vincom silt loams, 4 to 15 percent slopes
- 17B—Kerrdam silt loam, 0 to 4 percent slopes
- 17D—Kerrdam silt loam, 4 to 15 percent slopes
- 17E—Kerrdam silt loam, 15 to 35 percent slopes
- 18B—Dryfork silt loam, 0 to 4 percent slopes
- 19F—Vincom silt loam, 35 to 60 percent slopes
- 20E—Winkler gravelly loam, 15 to 35 percent slopes
- 20F—Winkler gravelly loam, 35 to 60 percent slopes
- 20G—Winkler-Rubble land complex, 40 to 70 percent slopes
- 21B—Totelake gravelly loam, 2 to 8 percent slopes
- 21D—Totelake gravelly loam, 8 to 15 percent slopes
- 21E—Combest gravelly silt loam, 15 to 35 percent slopes
- 21F—Combest gravelly silt loam, 35 to 60 percent slopes
- 22C—Courville gravelly silt loam, 2 to 8 percent slopes
- 22E—Winkler gravelly sandy loam, cool, 15 to 35 percent slopes
- 22F—Winkler gravelly sandy loam, cool, 35 to 60 percent slopes
- 22G—Winkler, cool-Rubble land complex, 40 to 70 percent slopes
- 23D—Yourame gravelly loam, 4 to 15 percent slopes
- 23E—Yourame gravelly loam, 15 to 30 percent slopes
- 23F—Yourame gravelly loam, 30 to 50 percent slopes
- 24B—Dubay silt loam, 0 to 4 percent slopes
- 24D—Dubay silt loam, 4 to 15 percent slopes
- 24E—Repp gravelly loam, 15 to 35 percent slopes
- 24F—Repp gravelly loam, 35 to 60 percent slopes
- 25D—Wildgen gravelly loam, 4 to 15 percent slopes
- 25E—Wildgen gravelly loam, 15 to 30 percent slopes
- 25F—Wildgen gravelly loam, 30 to 50 percent slopes
- 26F—Repp gravelly loam, cool, 35 to 60 percent slopes
- 27D—Wildgen gravelly loam, dry, 4 to 15 percent slopes
- 27E—Wildgen gravelly loam, dry, 15 to 30 percent slopes

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- 27F—Wildgen gravelly loam, dry, 30 to 50 percent slopes
28B—Bemishave loam, 0 to 4 percent slopes
28E—Eaglewing gravelly loam, 8 to 30 percent slopes
28F—Eaglewing gravelly loam, 30 to 50 percent slopes
29E—Yourame gravelly loam, dry, 15 to 30 percent slopes
29F—Yourame gravelly loam, dry, 30 to 50 percent slopes
30E—Tevis gravelly loam, 15 to 35 percent slopes
30F—Tevis gravelly loam, 35 to 60 percent slopes
30G—Tevis-Rubble land complex, 40 to 70 percent slopes
31E—Tevis gravelly loam, dry, 15 to 35 percent slopes
31F—Tevis gravelly loam, dry, 35 to 60 percent slopes
32E—Mitten gravelly silt loam, 15 to 35 percent slopes
32F—Mitten gravelly silt loam, 35 to 60 percent slopes
32G—Mitten-Rubble land complex, 40 to 70 percent slopes
33E—Mitten gravelly silt loam, dry, 15 to 35 percent slopes
33F—Mitten gravelly silt loam, dry, 35 to 60 percent slopes
34C—Krause gravelly silt loam, 2 to 8 percent slopes
34E—Winfall gravelly loam, 8 to 30 percent slopes
34F—Winfall gravelly loam, 30 to 50 percent slopes
35C—McCollum fine sandy loam, 4 to 8 percent slopes
35E—Courville gravelly silt loam, 8 to 30 percent slopes
35F—Courville gravelly silt loam, 30 to 50 percent slopes
36D—Rumblecreek gravelly loam, 4 to 15 percent slopes
36E—Rumblecreek gravelly loam, 15 to 30 percent slopes
36F—Rumblecreek gravelly loam, 30 to 50 percent slopes
37D—Rumblecreek gravelly loam, dry, 4 to 15 percent slopes
37E—Rumblecreek gravelly loam, dry, 15 to 30 percent slopes
37F—Rumblecreek gravelly loam, dry, 30 to 50 percent slopes
39F—Beeskove gravelly loam, 35 to 60 percent slopes
40E—Holloway gravelly silt loam, 15 to 35 percent slopes
40F—Holloway gravelly silt loam, 35 to 60 percent slopes
40G—Holloway-Rubble land complex, 40 to 70 percent slopes
41B—Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes
41C—Sacheen loamy fine sand, 2 to 8 percent slopes
41E—Sacheen loamy fine sand, 8 to 30 percent slopes
41F—Sacheen loamy fine sand, 30 to 60 percent slopes
42B—Selon fine sandy loam, 0 to 4 percent slopes
42D—Selon fine sandy loam, 4 to 15 percent slopes
42E—Holloway gravelly silt loam, cool, 15 to 35 percent slopes
42F—Holloway gravelly silt loam, cool, 35 to 60 percent slopes
42G—Holloway, cool-Rock outcrop complex, 40 to 70 percent slopes
43E—Waldbillig gravelly silt loam, 8 to 30 percent slopes

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- 44D—Waldbillig gravelly silt loam, cool, 4 to 15 percent slopes
- 45D—Phillcher gravelly silt loam, 8 to 30 percent slopes
- 45G—Phillcher-Rock outcrop complex, 40 to 70 percent slopes
- 46F—Felan gravelly silt loam, 35 to 60 percent slopes
- 47C—Elkrock cobbly silt loam, 2 to 6 percent slopes, stony
- 47D—Elkrock gravelly silt loam, 4 to 15 percent slopes
- 47E—Petty gravelly loam, 8 to 30 percent slopes
- 47F—Petty gravelly loam, 30 to 50 percent slopes
- 47G—Petty-Rubble land complex, 40 to 70 percent slopes
- 48C—Ashworth gravelly silt loam, 2 to 8 percent slopes
- 48E—Ashworth gravelly silt loam, 8 to 30 percent slopes
- 48F—Ashworth gravelly silt loam, 30 to 50 percent slopes
- 50B—Bigarm gravelly loam, 2 to 8 percent slopes
- 50D—Bigarm gravelly loam, 8 to 15 percent slopes
- 50E—Bigarm gravelly loam, 15 to 30 percent slopes
- 50F—Bigarm cobbly loam, 30 to 60 percent slopes
- 51A—Horseplains-Riverwash complex, 0 to 2 percent slopes
- 52D—Bigarm gravelly loam, cool, 4 to 15 percent slopes
- 52E—Bigarm gravelly loam, cool, 15 to 30 percent slopes
- 52F—Bigarm cobbly loam, cool, 30 to 60 percent slopes
- 53F—Hogsby-Rubble land-Rock outcrop complex, 15 to 60 percent slopes
- 54C—Yellowbay gravelly loam, 2 to 8 percent slopes
- 54E—Finleypoint gravelly loam, 15 to 30 percent slopes
- 54F—Finleypoint gravelly loam, 30 to 60 percent slopes
- 55B—Yourame gravelly loam, 0 to 4 percent slopes
- 55D—Niarada gravelly loam, 4 to 15 percent slopes
- 55E—Niarada gravelly loam, 15 to 30 percent slopes
- 55F—Niarada gravelly loam, 30 to 60 percent slopes
- 56A—Bowlake gravelly loam, 0 to 2 percent slopes
- 56B—Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes
- 57D—Minesinger gravelly loam, 4 to 15 percent slopes
- 57E—Minesinger stony loam, 15 to 30 percent slopes
- 58B—McDonald silt loam, 2 to 8 percent slopes
- 58D—McDonald silt loam, 8 to 15 percent slopes
- 58E—McDonald silt loam, 15 to 30 percent slopes
- 58F—Waldbillig gravelly silt loam, moist, 30 to 50 percent slopes
- 59D—Minesinger stony loam, cool, 4 to 15 percent slopes
- 59E—Minesinger stony loam, cool, 15 to 30 percent slopes
- 59F—Minesinger stony loam, cool, 30 to 50 percent slopes
- 60B—Bonnash gravelly silt loam, 0 to 4 percent slopes
- 60D—Niarada gravelly loam, cool, 4 to 15 percent slopes
- 60E—Niarada gravelly loam, cool, 15 to 30 percent slopes
- 60F—Niarada gravelly loam, cool, 30 to 60 percent slopes
- 61B—Scotmont fine sandy loam, 0 to 4 percent slopes
- 61D—Scotmont fine sandy loam, 4 to 15 percent slopes
- 61F—Flott gravelly loam, 30 to 50 percent slopes
- 62B—Beaverdump gravelly loam, 0 to 4 percent slopes

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- 62D—Beaverdump gravelly loam, 4 to 15 percent slopes
 62F—Flott gravelly loam, dry, 30 to 50 percent slopes
 64B—Lionwood loam, 0 to 4 percent slopes
 64E—Finleypoint gravelly loam, moist, 15 to 30 percent slopes
 64F—Finleypoint gravelly loam, moist, 30 to 60 percent slopes
 65A—Larchpoint silt loam, 0 to 2 percent slopes
 66A—Bigbeaver silt loam, 0 to 2 percent slopes
 66F—Battlebutte gravelly loam, 30 to 60 percent slopes
 67A—Glaciercreek gravelly silt loam, cool, 0 to 2 percent slopes
 67C—Glaciercreek gravelly silt loam, cool, 2 to 8 percent slopes
 67D—Koyokee gravelly loam, 4 to 15 percent slopes
 67E—Koyokee gravelly loam, 15 to 30 percent slopes
 68C—Upsata gravelly silt loam, 2 to 8 percent slopes
 68E—Upsata gravelly silt loam, 8 to 30 percent slopes
 68F—Upsata gravelly silt loam, 30 to 60 percent slopes
 69B—Meadowpass gravelly loam, 2 to 8 percent slopes
 69C—Tamarack loam, 2 to 8 percent slopes
 70B—Half Moon silt loam, 2 to 8 percent slopes
 70D—Half Moon silt loam, 8 to 15 percent slopes
 70E—Half Moon silt loam, 15 to 30 percent slopes
 71D—Loonlake gravelly silt loam, 4 to 15 percent slopes
 71E—Loonlake gravelly silt loam, 15 to 30 percent slopes
 72A—Blacklake mucky peat, 0 to 1 percent slopes
 72B—Millpocket silty clay loam, 2 to 8 percent slopes
 73A—Meadowpeak silt loam, 0 to 2 percent slopes
 74A—Blackcreek silt loam, 0 to 2 percent slopes
 75B—Tallcreek silt loam, 0 to 4 percent slopes
 76E—Felan gravelly silt loam, moist, 15 to 35 percent slopes
 76F—Felan gravelly silt loam, moist, 35 to 60 percent slopes
 77D—Beeskove gravelly loam, moist, 4 to 15 percent slopes
 77E—Beeskove gravelly loam, moist, 15 to 35 percent slopes
 77F—Beeskove gravelly loam, moist, 35 to 60 percent slopes
 78B—Fernline silt loam, 0 to 4 percent slopes
 78D—Fernline silt loam, 4 to 15 percent slopes
 80F—Sharrott-Rubble land-Rock outcrop complex, 15 to 60 percent slopes
 81E—Noxlin silt loam, 8 to 35 percent slopes, stony
 82B—Bignell gravelly loam, 0 to 4 percent slopes
 82D—Bignell gravelly loam, 4 to 15 percent slopes
 82E—Bignell gravelly loam, 15 to 35 percent slopes
 82F—Sharrott, cool-Rock outcrop-Rubble land complex, 15 to 60 percent slopes
 83B—Backroad gravelly silt loam, 0 to 4 percent slopes
 83D—Backroad gravelly silt loam, 4 to 15 percent slopes
 84E—Lozeau gravelly loam, 8 to 30 percent slopes
 84F—Lozeau gravelly loam, 30 to 50 percent slopes
 85A—Hogheaven silt loam, 0 to 2 percent slopes
 85B—Whitepine silt loam, 0 to 4 percent slopes
 85D—Whitepine silt loam, 4 to 15 percent slopes
 86C—Bata gravelly silt loam, 2 to 8 percent slopes
 86E—Bata gravelly silt loam, 8 to 30 percent slopes
 87E—Pashua gravelly loam, 8 to 30 percent slopes
 87F—Stevie gravelly silt loam, 35 to 60 percent slopes
 88C—Dewberry silt loam, 2 to 8 percent slopes
 88E—Dewberry gravelly silt loam, 8 to 45 percent slopes
 89B—Iffgulch clay, 0 to 4 percent slopes

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- 89E—Selway gravelly sandy loam, 8 to 30 percent slopes
- 90A—Camascreek silt loam, 0 to 2 percent slopes
- 91B—Biglake gravelly loam, 0 to 8 percent slopes
- 91D—Stargulch very fine sandy loam, 4 to 15 percent slopes
- 92C—Oldtrail gravelly sandy loam, 0 to 8 percent slopes
- 93A—Horseplains fine sandy loam, 0 to 2 percent slopes
- 94A—Revais silt loam, 0 to 2 percent slopes
- 94D—Berray silt loam, 4 to 15 percent slopes
- 95A—Gardencreek silty clay loam, 0 to 2 percent slopes
- 96A—Clearcreek silt loam, 0 to 2 percent slopes
- 96D—Courvash cobbly silt loam, 4 to 15 percent slopes
- 96E—Courvash cobbly silt loam, 15 to 35 percent slopes
- 97C—Remount very gravelly loam, 2 to 12 percent slopes
- 97E—Remount very gravelly loam, 12 to 25 percent slopes
- 97F—Mollman gravelly loam, 30 to 50 percent slopes
- 98C—Doglake extremely cobbly loam, 2 to 12 percent slopes
- 98E—Bendahl gravelly silt loam, 15 to 30 percent slopes
- 98F—Bendahl gravelly silt loam, 30 to 50 percent slopes
- 99A—McLangor-Meadowpeak complex, 0 to 2 percent slopes
- 99C—Lesier gravelly silt loam, 2 to 8 percent slopes
- 99E—Lesier gravelly silt loam, 8 to 30 percent slopes
- 100—Rock outcrop-Rubble land complex
- 103B—Gird-McCollum complex, 0 to 4 percent slopes
- 105B—Whitearth-Slickspots complex, 2 to 8 percent slopes
- 106D—Sacheen-Dune land complex, 4 to 15 percent slopes
- 112A—Marklepass-Slickspots complex, 0 to 4 percent slopes
- 113D—Round Butte-Irvine silty clay loams, 4 to 15 percent slopes
- 116E—Irvine-Round Butte silty clay loams, 8 to 35 percent slopes
- 116F—Irvine-Lake sediment outcrop complex, 35 to 60 percent slopes
- 117E—Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes
- 118B—Dryfork-Selow silt loams, 0 to 4 percent slopes
- 118D—Dryfork-Kerrdam silt loams, 4 to 15 percent slopes
- 119E—Vincom-Lonepine silt loams, 15 to 35 percent slopes
- 119F—Vincom-Lake sediment outcrop complex, 35 to 60 percent slopes
- 120G—Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes
- 122E—Winkler, cool-Sharrott, cool-Rock outcrop complex, 8 to 40 percent slopes
- 122G—Winkler, cool-Sharrott, cool-Rubble land complex, 40 to 85 percent slopes
- 123D—Yourame-Wildgen gravelly loams, 8 to 30 percent slopes
- 123E—Mocmont-Winkler complex, 8 to 35 percent slopes
- 126G—Repp-Rock outcrop complex, 40 to 70 percent slopes
- 132F—Mitten-Tevis complex, 35 to 60 percent slopes
- 134E—Winfall-Courville complex, 8 to 30 percent slopes
- 138E—Winfall-Courville complex, dry, 8 to 30 percent slopes

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- 143E—Waldbillig-Holloway gravelly silt loams, 8 to 30 percent slopes
143F—Holloway-Waldbillig gravelly silt loams, 30 to 50 percent slopes
144E—Waldbillig-Holloway gravelly silt loams, cool, 8 to 30 percent slopes
144F—Holloway-Waldbillig gravelly silt loams, cool, 30 to 50 percent slopes
148C—Bigarm gravelly loam, cool, 2 to 8 percent slopes, very stony
148E—Bigarm gravelly loam, cool, 8 to 25 percent slopes, very stony
150E—Bigarm-Hogsby-Rock outcrop complex, 8 to 30 percent slopes
150F—Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes
151A—Revais silt loam, gravelly substratum, 0 to 2 percent slopes
152E—Bigarm, cool-Hogsby-Rock outcrop complex, 8 to 30 percent slopes
152F—Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes
153F—Hogsby-Finleypoint-Rock outcrop complex, 30 to 60 percent slopes
166E—Battlebutte-Bigdraw-Welded tuff outcrop complex, 15 to 30 percent slopes
166F—Battlebutte-Welded tuff outcrop complex, 30 to 60 percent slopes
168D—Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes
197C—Remount-Bowlake complex, 2 to 12 percent slopes
200—Riverwash
211G—Combest-Rubble land complex, 40 to 70 percent slopes
213A—Round Butte-Selow complex, 0 to 2 percent slopes
213B—Round Butte-Selow complex, 2 to 8 percent slopes
215B—Lonepine-Round Butte complex, 2 to 8 percent slopes
217E—Kerrdam-Round Butte-Irvine complex, 8 to 35 percent slopes
218D—Dryfork-Selow silt loams, 4 to 15 percent slopes
221F—Courville-Rockhill-Rock outcrop complex, 30 to 50 percent slopes
222F—Courville gravelly silt loam, dry, 30 to 50 percent slopes
250E—Bigarm-Rubble land complex, 15 to 30 percent slopes
250F—Bigarm-Rubble land complex, 30 to 60 percent slopes
251A—Horseplains fine sandy loam, gravelly substratum, 0 to 2 percent slopes
252E—Bigarm, cool-Rubble land complex, 15 to 30 percent slopes
252F—Bigarm, cool-Rubble land complex, 30 to 60 percent slopes
254F—Finleypoint-Rubble land complex, 30 to 60 percent slopes
261C—Gird-McCollum complex, 4 to 8 percent slopes
266E—Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes
291B—Half Moon silt loam, cool, 2 to 8 percent slopes
291D—Half Moon silt loam, cool, 8 to 15 percent slopes
291E—Half Moon silt loam, cool, 15 to 35 percent slopes
291F—Half Moon silt loam, cool, 35 to 60 percent slopes
292B—McCollum fine sandy loam, 0 to 4 percent slopes
322E—Holloway gravelly silt loam, moist, 15 to 35 percent slopes
322F—Holloway gravelly silt loam, moist, 35 to 60 percent slopes
323G—Holloway, moist-Rock outcrop complex, 40 to 70 percent slopes

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- 341C—Krause very cobbly silt loam, 2 to 8 percent slopes
- 350B—Bigarm gravelly loam, alluvial, 2 to 8 percent slopes
- 350D—Bigarm gravelly loam, alluvial, 8 to 15 percent slopes
- 350E—Bigarm gravelly loam, alluvial, 15 to 30 percent slopes
- 350F—Bigarm gravelly loam, alluvial, 30 to 50 percent slopes
- 351C—McCollum-Belton fine sandy loams, 4 to 8 percent slopes
- 351D—McCollum-Belton fine sandy loams, 8 to 15 percent slopes
- 366E—Battlebutte-Bigdraw gravelly loams, moist, 8 to 30 percent slopes
- 366F—Battlebutte-Bigdraw gravelly loams, moist, 30 to 60 percent slopes
- 374F—Mitten-Rock outcrop complex, 40 to 70 percent slopes
- 392D—Rumblecreek gravelly loam, 8 to 15 percent slopes, stony
- 392E—Rumblecreek gravelly loam, 15 to 30 percent slopes, stony
- 411E—Sacheen-Rock outcrop complex, 8 to 30 percent slopes
- 421B—Selon fine sandy loam, moist, 0 to 4 percent slopes
- 421D—Selon fine sandy loam, moist, 4 to 15 percent slopes
- 421E—Selon fine sandy loam, moist, 15 to 30 percent slopes
- 422F—Selon-Bemishave complex, 15 to 60 percent slopes
- 441F—Tevis-Rock outcrop complex, 30 to 60 percent slopes
- 471D—Elkrock cobbly silt loam, 4 to 15 percent slopes, extremely bouldery
- 472B—Elkrock gravelly silt loam, moist, 0 to 4 percent slopes
- 472D—Elkrock gravelly silt loam, moist, 4 to 15 percent slopes
- 472F—Elkrock gravelly silt loam, moist, 30 to 60 percent slopes
- 473D—Elkrock-Selon complex, 4 to 15 percent slopes
- 513A—Sonyok silty clay loam, 0 to 4 percent slopes
- 522F—Winfall-Courville complex, 30 to 60 percent slopes
- 532E—Winkler-Sharrott-Rock outcrop complex, 8 to 40 percent slopes
- 541C—Yellowbay gravelly loam, moist, 2 to 8 percent slopes
- 542F—Yellowbay-Selon-Bemishave complex, 15 to 60 percent slopes
- 543F—Yellowbay-Selon-Sacheen complex, 15 to 60 percent slopes
- 582E—Waldbillig-Holloway gravelly silt loams, moist, 15 to 30 percent slopes
- 582F—Waldbillig-Holloway gravelly silt loams, moist, 30 to 50 percent slopes
- 631E—Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes
- 632F—Rockhill-Rock outcrop complex, 15 to 60 percent slopes
- 641D—Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes
- 641E—Lionwood-Scotmont-Whitepine complex, 15 to 35 percent slopes
- 671C—Glaciercreek gravelly silt loam, 2 to 8 percent slopes
- 671E—Glaciercreek gravelly silt loam, 8 to 30 percent slopes
- 691B—Tamarack-Crystalex complex, 0 to 4 percent slopes
- 691D—Tamarack-Crystalex complex, 4 to 15 percent slopes
- 691E—Tamarack-Crystalex complex, 15 to 30 percent slopes

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- 691F—Tamarack-Crystalex complex, 30 to 60 percent slopes
 692B—Tamarack fine sandy loam, 0 to 4 percent slopes
 731A—Meadowpeak-Firetower silt loams, 0 to 2 percent slopes
 732A—Meadowpeak silt loam, 0 to 2 percent slopes, frequently flooded
 771G—Beeskove-Mollman-Rock outcrop complex, 40 to 80 percent slopes
 781D—Fernline-Cabinet silt loams, 4 to 15 percent slopes
 781E—Fernline-Cabinet silt loams, 15 to 30 percent slopes
 791B—Redlock-Fernline silt loams, 0 to 4 percent slopes
 791D—Redlock-Fernline silt loams, 4 to 15 percent slopes
 791E—Redlock-Fernline silt loams, 15 to 35 percent slopes
 792D—Redlock-Fernline-Iffgulch complex, 0 to 15 percent slopes
 807A—McLangor mucky peat, 0 to 2 percent slopes
 808A—Barzee mucky peat, 0 to 2 percent slopes
 811D—Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony
 821D—Combest gravelly silt loam, 4 to 15 percent slopes
 824E—Dubay silt loam, 15 to 30 percent slopes
 834F—Krause gravelly silt loam, 15 to 45 percent slopes
 842E—Selon fine sandy loam, 15 to 30 percent slopes
 842F—Selon fine sandy loam, 30 to 60 percent slopes
 858E—Waldbillig gravelly silt loam, moist, 8 to 30 percent slopes
 860D—Bonnash gravelly silt loam, 4 to 15 percent slopes
 860E—Bonnash gravelly silt loam, 15 to 35 percent slopes
 862E—Beaverdump gravelly loam, 15 to 35 percent slopes
 867E—Glaciercreek gravelly silt loam, cool, 8 to 30 percent slopes
 867F—Glaciercreek gravelly silt loam, cool, 30 to 45 percent slopes
 871G—Stevie-Rock outcrop complex, 40 to 70 percent slopes
 884E—Loneman silt loam, 15 to 35 percent slopes
 884F—Loneman silt loam, 35 to 60 percent slopes
 887E—Stevie gravelly silt loam, 15 to 35 percent slopes
 891B—Stargulch very fine sandy loam, 0 to 4 percent slopes
 893A—Bigbeaver silt loam, 0 to 2 percent slopes, frequently flooded
 895A—Ibex silt loam, 0 to 2 percent slopes
 897C—Mollman gravelly loam, 2 to 8 percent slopes
 897E—Mollman gravelly loam, 8 to 30 percent slopes
 971E—Mollman gravelly loam, dry, 15 to 30 percent slopes
 971F—Mollman gravelly loam, dry, 30 to 50 percent slopes
 DA—Denied access
 DAM—Dam
 W—Water

Summary of Tables

Temperature and precipitation	12
Freeze dates in spring and fall	14
Growing season	15

For tables with the most current data, please visit the
Soil Data Mart at <http://soildatamart.nrcs.usda.gov/>.

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Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from local Natural Resources Conservation Service or Cooperative Extension Service offices.

There are 35,700 acres of cropland in the survey area. Approximately 32,000 acres are hayland. About 15,000 acres, or 47 percent, of the hayland is irrigated, with most hay grown in the eastern semiarid valleys. About 41 percent of the cropland is irrigated. Most of the small grains are grown in the Paradise-Thompson Falls area. An additional 17,000 acres are dry and irrigated pasture throughout the survey area.

Common annual crops include winter wheat, spring wheat, barley, and oats. Perennial forages are mainly grass-legume and legume hay. Some oats and barley are also grown for hay. Field peas and mint are increasing in popularity. The Paradise-Thompson Falls area is well suited to fruit trees, vegetables, and nurseries.

Climate and soils vary widely throughout the survey area. For discussion purposes, there are three distinct regions, each having unique management concerns. These regions are the eastern semiarid valleys, the Paradise-Thompson Falls area, and the Thompson Falls-Heron area; these last two areas make up the Clark Fork River valley. A problem common to each region is the lack of growing-season rainfall. Unlike eastern Montana farmlands that receive about 70 percent of their annual moisture during the growing season, this survey area receives only about 30 percent. This shortage of growing-season moisture most severely impacts the semiarid valley areas.

Eastern Semiarid Valleys

The eastern semiarid valley region is characterized by annual precipitation of less than 14 inches and by valley bottom soils that formed mainly in glacial lake sediments on nearly level to strongly dissected lake terraces. Large portions of these soils have high levels of sodium salts and are low in organic matter.

Management efforts should be aimed at overcoming the effects of sodium salts, low organic matter, and inadequate growing-season rainfall. Irrigation is required to successfully annual crop most of these soils. Irrigation, proper fertilization, and increasing organic matter will help to overcome the effects of sodium. These soils are best suited to growing perennial forage crops that will maintain or increase the organic matter levels.

Paradise-Thompson Falls Area

This area is mild with annual precipitation of about 17 inches per year. The dominant soils are formed in loamy alluvial deposits on nearly level terraces along the river. These soils are productive with few limitations for cropping. Most of these soils are prime farmland if irrigated.

The high terraces above the valley floor are formed in deposits left by the draining of glacial Lake Missoula. These terraces are nearly level to strongly dissected mixed sand and clay material.

Management concerns for this area include water erosion on frozen soil and localized soil blowing. Residue management, surface roughening, and crop rotation will reduce soil blowing and water erosion.

Thompson Falls-Heron Area

This area is moister and cooler than the other two areas with annual precipitation over 25 inches and a

growing season generally less than 90 days. The valley floor is a combination of stream terraces and reworked deposits of glacial Lake Missoula. Shallow water tables are common. Most of these soils formed under forest vegetation and are generally acidic and low in fertility.

Management efforts should be aimed at overcoming the short growing season, low fertility, and soil acidity. Shallow water tables present an additional challenge. Choosing quick maturing varieties, harvesting grain for hay, and raising perennial forages help to overcome the short growing season. Adding lime, fertilizer, and other soil amendments along with selecting acid-tolerant crops can overcome soil limitations. Areas with shallow water tables are best left in perennial vegetation.

Cropland Limitations and Hazards

Management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table, "Main Cropland Limitations and Hazards." The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water infiltration rate. Applying conservation tillage and conservation-cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation-cropping systems, crop-residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green-manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels*, *flooding*, *depth to rock*, *ponding*, *gullies*, and *lack of timely precipitation*.

Additional limitations and hazards are as follows:

Areas of rock outcrop and slickspots—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Excessive permeability—This limitation causes deep leaching of nutrients and pesticides. The capacity of the soil to retain moisture for plant use is poor.

Lime content, limited available water capacity, poor tilth, restricted permeability, and surface crusting—These limitations can be overcome by incorporating green-manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation-cropping systems. In addition, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water pollution—This limitation is a hazard in soils with excessive permeability, hard bedrock, or a water table within the profile.

Short frost-free period—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Slope—Where the slope is more than 8 percent, soil blowing and water erosion may be accelerated unless conservation-farming practices are applied.

Surface rock fragments—This limitation causes rapid wear of tillage equipment; it cannot be easily overcome.

Surface stones—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils, the main management concerns are *efficient water use*, *nutrient management*, *control of erosion*, *pest and weed control*, and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, overirrigation can create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Areas of slickspots—Slickspots are a named component of the map unit.

Channeled—The word “channeled” is included in the name of the map unit.

Depth to rock—Bedrock is within a depth of 40 inches.

Excessive permeability—The upper limit of the permeability range is 6 inches or more within the soil profile.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Gullied—The word “gullied” is included in the name of the map unit.

Lack of timely precipitation—The component of the map unit has a xeric moisture regime, and the amount of annual precipitation is no more than 14 inches.

Lime content—The component is assigned to wind erodibility group 4L or has more than 5 percent lime in the upper 10 inches. Wind erodibility groups are defined in the “Soil Properties” section.

Limited available water capacity—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 5 inches or less.

Ponding—Ponding duration is assigned to the component of the map unit.

Poor tilth—The component of the map unit has more than 35 percent clay in the surface layer.

Potential for ground-water pollution—The soil has a water table within a depth of 4 feet or hard bedrock within the profile, or permeability is more than 6 inches per hour within the soil.

Restricted permeability—Permeability is 0.06 inch per hour or less within the soil profile.

Salt content—The component of the map unit has an electrical conductivity of more than 4 in the surface layer or more than 8 within a depth of 30 inches.

Short frost-free period—The map unit has a growing season of less than 90 frost-free days.

Slope—The upper slope range of the component of the map unit is more than 8 percent.

Sodium content—The sodium adsorption ratio of the component of the map unit is more than 13 within a depth of 30 inches.

Soil blowing—The wind erodibility index multiplied by the selected high C factor for the survey area and then divided by the T factor is more than 8 for the component of the map unit.

Surface crusting—The sodium adsorption ratio in the surface layer is 5 or more for any texture and 4 or more if the texture is silt, silt loam, loam, or very fine sandy loam.

Surface rock fragments—The terms describing the texture of the surface layer include any rock fragment modifier except for gravelly or channery, and “surface stones” is not already indicated as a limitation.

Surface stones—The terms describing the texture of the surface layer include any stony or bouldery modifier or the soil is a stony or bouldery phase.

Water erosion—The surface K factor multiplied by the upper slope limit is more than 2 (same as prime farmland criteria).

Water table—The component of the map unit has a water table within a depth of 60 inches.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops are shown in the table, “Land Capability and Yields per Acre of Crops and Pasture.” In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit is shown in the table.

The nonirrigated small grain yields presented are a maximum potential estimated using a crop yield model based on Montana Agricultural Experiment Station Special Report Number 35 (Brown and Carlson, 1990). Basic model assumptions include soil moisture at field capacity to 40 inches, a 70 percent annual precipitation probability as published by the National Climatic Center, fertilization to yield, and full pest and weed control. Irrigated small grain yields are not provided. The model has been validated with collected yield data.

Forage crop yields are estimates based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management practices can include improving drainage, controlling erosion, and protecting areas from flooding; selecting proper planting and seeding rates; choosing suitable high-yielding crop varieties; appropriately and timely tilling; controlling weeds, plant diseases, and harmful insects; ensuring favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effectively using crop residue, barnyard manure, and green-manure crops; and harvesting to ensure the smallest possible loss.

For provided irrigated crop yields, it is assumed that the irrigation system is adapted to the soils and

to the forage crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Management

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often indicated in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide information about forage yields other than those shown in the table, "Land Capability and Yields per Acre of Crops and Pasture."

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest land, or for engineering purposes.

In the capability system, as described in "Land Capability Classification" (U.S. Department of Agriculture, 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These levels indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grains, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 5. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7. Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide guidance on the use of these soils as cropland.

Areas in class 8 are generally not suitable for cropland, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses indicate the dominant limitations in the class. These subclasses are designated by adding a letter, *E*, *W*, *S*, or *C*, to the class numeral, for example, 2E. The letter *E* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *W* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *S* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *C*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *W*, *S*, or *C*.

because the soils in class 5 are subject to little or no erosion. Class 5 soils have other limitations that restrict their use mainly to pasture, rangeland, forest land, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table, "Land Capability and Yields per Acre of Crops and Pasture," at the end of this section.

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table, "Prime and Important Farmland," at the end of this section.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in the table, "Prime and Important Farmland." This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. The need for these measures is indicated in parentheses after the map unit name. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in the "Acreage and Proportionate Extent of the Soils" table. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, cranberries, olives, tree nuts, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of stored moisture, precipitation, or irrigation; and has a combination of soil qualities, growing season, temperature, humidity, air drainage, elevation, aspect, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Additional Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate state

agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states, additional farmland of statewide importance may include tracts of land that have been designated for agriculture by state law.

Farmland of statewide importance is included in the list of prime farmland. Criteria is available in the "Montana Field Office Technical Guide" (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II).

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having nationwide or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill water erosion. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of

rainfall and runoff. The most important soil properties are the content of silt plus very fine sand; the content of sand coarser than very fine sand; and the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (K_f) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. K_f factor shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullyng, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. Wind erodibility groups are defined in the "Soil Properties" section.

Local offices of the Natural Resources Conservation Service or the Cooperative Extension Service can provide additional information about wind erodibility groups and K, K_f, T, and I factors.

Range

Sue Noggles, Rangeland Management Specialist, Natural Resources Conservation Service, helped to prepare this section.

Approximately 250,000 acres, or 26 percent, of the survey area supports rangeland vegetation. About 320,000 acres, or 33 percent, supports forest understory vegetation that is suitable for livestock grazing.

Cow-calf operations are the major type of livestock enterprise. Range and forestland grazing are supplemented with both irrigated and nonirrigated pasture and hayland regrowth. A 5- to 6-month winter feed period is common throughout the area.

The range is used primarily for grazing domestic livestock. However, it also is used as wildlife habitat, recreational areas, and watershed, and it has esthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rangeland is defined as land on which the historic climax plant community is predominantly grasses, grasslike plants, forbs, or shrubs. Rangeland includes lands revegetated naturally or artificially when routine management of that vegetation is accomplished mainly through manipulation of grazing. Rangeland includes natural grasslands, savannas, shrublands, most deserts, tundra, alpine communities, coastal marshes, and wet meadows (U.S. Department of Agriculture, 1976). The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazeable forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native and naturalized pasture are defined as forestland and naturalized open areas, other than rangeland, that are used primarily for the production of forage for grazing by livestock and wildlife.

Overstory trees, if present, are managed to promote naturally occurring native and introduced understory forage species located on the site (U.S. Department of Agriculture, 1976).

The table, "Rangeland and Grazeable Understory—Productivity and Characteristic Plant Communities," shows, for each listed soil, the ecological site (rangeland ecological site or representative habitat type); the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic native vegetation; and the average percent composition of each species. Only those soils that are used as rangeland or grazeable forestland, or are suited to use as rangeland or grazeable forestland, are listed. Explanation of the column headings in this table follows.

Ecological site includes rangeland ecological site and representative habitat type as defined below.

Rangeland ecological site is a distinctive kind of rangeland with specific physical characteristics, which differs from other kinds of rangeland in its ability to produce a distinctive kind and amount of vegetation (U.S. Department of Agriculture, 1976).

Many different ecological sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, ecological sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. The "Montana Field Office Technical Guide," (U.S. Department of Agriculture, Natural Resources Conservation Service, Section II) available at local offices of the Natural Resources Conservation Service, can provide specific information about rangeland ecological sites.

Representative habitat type is an aggregation of all land areas capable of producing similar climax plant communities. Habitat types are considered basic ecological subdivisions of landscapes. Each is recognized by distinctive combinations of overstory and understory plant species at climax. They are named for the dominant or characteristic vegetation of the climax community. Habitat types are useful in soil surveys when assessing the combined effects of aspect, slope, elevation, and soil properties on potential plant growth. The representative habitat type or phase displayed in this table is documented in the Pfister system (Pfister and others, 1977).

Total annual production is the amount of vegetation that can be expected to grow annually on well-managed range that is supporting the historic climax plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. Total annual production does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation, along with temperature, make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic native vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. For grazed forestland, the table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forestland in which the production of wood crops is highest.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy

determines the amount of light that understory plants receive.

Similarity Index

Similarity index, one method to evaluate an ecological site, compares the present plant community to the historic climax plant community for that site or to a desired plant community that is one of the site's potential vegetation states. The similarity index to the historic climax plant community is the percentage, by weight, of historic climax vegetation present on the site. Likewise, a similarity index to a desired plant community is the percentage, by weight, of the desired plant community present on the site. As the name implies, this method assesses the similarity of the plant community to the historic climax or desired plant community. The similarity index can provide an indication of past disturbances, as well as future management or treatment, or both, needed to achieve the client's objectives (U.S. Department of Agriculture, 1976).

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants within a community. These plants will eventually die if they are continually grazed. A very severe disturbance can destroy the natural community. Under these conditions, less desirable plants, such as annuals and weeds, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Knowledge of the ecological site and the similarity index is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, potential for recreational uses, and condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires knowledge of the similarity index for the ecological site.

The objective in grazing land management is to provide the kind of plant community that provides for and maintains a healthy ecosystem, produces quality forage for the grazing animals, and meets the needs

of the grazing land enterprise and the desires of the landowner (U.S. Department of Agriculture, 1976). Proper grazing management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a similarity index percentage somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experience of ranchers and research has shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained, and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. Also, the plant cover protects the soil from water erosion and soil blowing, increases moisture retention, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These practices include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation; should meet the needs of the individual operator; and should be designed according to topography, type of grazing animals, and resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These practices include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. Capability classes are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical

brush and weed control, and water spreading. Those soils in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for seeding and as a means of increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow absorption of more moisture and production of more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of desired plants.

Seeding may be needed in areas where less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established. Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Understory Management

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forestland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

Forest understory production can be influenced by controlling canopy density in addition to the management of stocking rates, distribution, and season of use. Often both the woodland and range resources can be enhanced through thinning the overstory to canopy levels that optimize both timber and forage production. Broadcast seeding of disturbed areas soon after timber harvest can improve forage quantity and quality and reduce the chances of undesirable plants occupying the site.

Steepness of slopes and distance to drinking water are severe grazing management problems in much of the mountain and foothill areas. Variations in primary season of use, production levels, and plant communities because of elevation and aspect changes present additional challenges. Long, steep slopes provide limited access to livestock. Less sloping areas are subject to overuse. Grazing should be delayed until the soil is firm enough to withstand trampling and the plants have matured enough to withstand grazing pressure.

Riparian areas should be protected from overuse by livestock. Misuse results in deterioration of protective vegetation, reduction of streambank stability, and excessive erosion. Developing off-

stream-watering locations can successfully prevent cattle from overgrazing riparian areas and encourage better livestock distribution.

Forestland

Forestland makes up 650,000 acres, or 68 percent, of the survey area. Forest acreage, by ownership, is as follows: corporate timberlands—185,000 acres; Confederated Salish and Kootenai Tribes—190,000 acres; and nonindustrial private—275,000 acres.

Available water capacity, depth, fertility, and texture influence the ability of soils to support tree growth. Aspect, climate, elevation, and soils determine the kinds of trees that can grow on any site and their growth rates. In the survey area, the forested soils range from shallow to very deep, from nongravelly to extremely gravelly, and from fine textured to coarse textured. Because of differences among the soils, as well as differences in climate, geology, and topography, forests vary in composition and productivity.

Forested soils and adapted tree species are related to environmental gradients of soil temperature and moisture. Ponderosa pine is the only adapted tree species on xeric, frigid soils, including the sandy Sacheen and the clayey, sodium-affected, Millpocket soils. Western black cottonwood is typically associated with Lamoose and similar soils on low stream terraces and flood plains throughout the survey area. Lamoose and similar soils flood and have a water table near the soil surface during part of the growing season. Mean annual precipitation for this group ranges from 14 to 18 inches.

Generally, precipitation increases and temperature decreases with elevation gains in the foothill and mountain areas. As the topography becomes more rugged, aspect becomes a significant environmental factor. Ponderosa-pine and Douglas-fir forests with a bunchgrass-dominated understory typify ustic—dry, frigid soils. Landscapes include steep low- to mid-elevation south- and west-facing slopes, generally below 5,000 feet. The effective precipitation ranges from 18 to 20 inches. Associated soils include Finleypoint dry, Repp, Sharrott dry, Winkler, and Yourame dry.

Ponderosa-pine and Douglas-fir forests with an understory of common snowberry, kinnikinnick, mallow ninebark, Oregongrape, and pinegrass

dominate the ustic—moist, frigid soils. Landscapes include gentle low- to mid-elevation slopes on all aspects and steep topography on northern and eastern aspects below 4,000 feet. The effective precipitation ranges from 20 to 25 inches. Associated soils include Combest, Eaglewing, Finleypoint, Flott, Half Moon, Lozeau, Mocmont, Repp cool, Sharrott, Wildgen, Winkler cool, and Yourame.

With increased effective precipitation, udic, frigid soils support forests of western larch and grand fir along with Douglas-fir, lodgepole pine, and ponderosa pine. In the west end valley floor areas, western white pine, western red cedar, and western hemlock are also adapted. Common understory plants consist of beargrass, blue huckleberry, pinegrass, and twinflower. Landscapes include steep northern and eastern aspects below 5,000 feet and gentle topography on all aspects where effective precipitation ranges from 25 to 35 inches. Associated soils include Courville, Mitten, Rumblecreek, Selway, Tevis, and Winfall.

In the Salish Mountains, the temperatures are cool, but precipitation is relatively low. In this udic--dry, frigid area, the overstory contains western larch along with Douglas-fir and ponderosa pine with an understory of snowberry, pinegrass, Oregongrape, and kinnikinnick. The absence of blue huckleberry reflects the lower effective precipitation that ranges from 22 to 25 inches. Associated soils include Courville dry, Mitten dry, and Rumblecreek dry, Tevis dry, and Winfall dry.

The cold, moist environments at elevations above 5,000 feet on northern and eastern aspects and on all aspects above 6,000 feet are represented by the udic, cryic soils including Felan, Holloway, Phillcher, and Waldbillig. Douglas-fir, Engelmann spruce, lodgepole pine, subalpine fir, and western larch are associated with the lower elevations within this group. Common understory plants include beargrass, grouse whortleberry, and rusty menziesia. In the upper elevation ranges of this group, cool cryic climatic phases of the Holloway and Waldbillig soils support Engelmann spruce, lodgepole pine, and subalpine fir, with Douglas-fir and western larch no

longer adapted. The Phillcher soil occurs only at the highest elevations near the timberline where mountain heath and whitebark pine, along with Engelmann spruce and subalpine fir, become significant plant community components

The soil temperature regimes (cryic and frigid) and the soil moisture regimes (udic, ustic, and xeric) associated with the soils in the above environments are defined in "Keys to Soil Taxonomy" (U.S. Department of Agriculture, 1998).

Forest managers can use the "Forestland Management" and "Forestland Productivity" tables to plan the use of soils for wood crops. Only those soils suitable for wood crops are listed. The estimates of the productivity of the soils in this survey are based on data acquired in the survey area and on published data (Alexander, 1966; Brickell, 1966; Brickell, 1968; Cummings, 1937; Dahms, 1964; Haig, 1932; Meyer, 1938; Mont. Dept. of State Lands, 1982; Myers, 1967; Sauerwein, 1979).

Woodland Ordination System

The "Forestland Management" table lists the ordination (woodland suitability) symbol for each soil. The ordination system is a nationwide uniform system of labeling soils or groups of soils that are similar in use and management. The primary factors evaluated in the woodland ordination system are productivity of the forest overstory tree species and the principal soil properties resulting in hazards and limitations that affect forest management. There are three parts of the ordination system—class, subclass, and group. The class and subclass are referred to as the ordination symbol.

Ordination Class Symbol

The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species; the larger the number, the greater the potential productivity. Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, the number 1 indicates a potential production of 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year), and 10 indicates a potential production of 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year).

Indicator species is a species that is common in the area and is generally, but not necessarily, the most productive on the soil. It is the species that

determines the ordination class. In the "Forestland Productivity" table, an indicator species is the first species listed for a particular map unit. This table shows the productivity for all species where data have been collected.

Site index is determined by taking height measurements and determining the age of selected trees within stands of a given species (Alexander, 1966). This index is the average height, in feet, that the trees attain in a specified number of years. This index applies to fully stocked, even-aged, unmanaged stands. The site indexes shown in the "Forestland Productivity" table are averages based on measurements made at sites that are representative of the soil series. When the site index and forestland productivity of different soils are compared, the values for the same tree species should be compared (Dahms, 1964). The higher the site index number, the more productive the soil for that species. Site index values are used in conjunction with yield tables (Cummings, 1937; Myers, 1967) to determine mean annual yields. Indirectly, they are used to determine the productivity class in the ordination class symbol.

Expected tree growth rate and the diversity of trees on a site are determined by a combination of elevation, aspect, soils, and climate. The ability of soils to support tree growth is dependent on variability in soil depth, fertility, texture, and available water capacity. Forested soils in the area range from shallow to very deep, nongravelly to extremely gravelly, fine textured to coarse textured, and those containing no lime to those containing high amounts of lime.

Equipment limitations were related to logging operations. Of prime consideration were difficulties encountered in yarding logs and the influence of logging activities on soil properties. Primary soil features considered for this rating were slope, soil texture, soil depth, seasonal soil wetness, and stoniness.

Seedling mortality ratings apply to planting stock one or two years of age, with the evaluation period beginning at the time of planting. For natural regeneration, the evaluation period was considered to begin a year after germination.

Windthrow hazard ratings were developed as follows:

Soils on north slopes that remain moist into the spring, and those having a high basal area to limit root development, were considered moderately prone to windthrow even though the soil materials provided a good anchoring medium for tree roots. On drier sites, clayey soils without rock fragments were also considered in this category.

Soils having a high water table (within 20 inches of the surface) long enough to inhibit root development were considered to be severely susceptible to windthrow.

When making ratings for plant competition, the limitation was considered slight if adequate regeneration usually occurs on a soil within 5 years.

For most species, overstory yield estimates were determined from the average annual yield versus site index curves. These curves were developed by adjusting data presented in yield tables published from several different sources. Average annual yield values were computed at the culmination of mean annual increment. Total cubic-foot-volume estimates are based on trees that are more than 4-inch diameter breast height.

Ordination Subclass Symbol

The second element, or subclass, of the ordination symbol is a capital letter that indicates certain soil or physiographic characteristics that contribute to important hazards or limitations to be considered in management. The subclasses are defined as follows:

Subclass X indicates that forestland use and management are limited by stones or rocks.

Subclass W indicates that forestland use and management are significantly limited by excess water, either seasonally or throughout the year. Restricted drainage, a high water table, or flooding can adversely affect either stand development or management.

Subclass T indicates that forestland use and management are limited by a root zone that has toxic substances. Excessive alkalinity, acidity, sodium salts, or other toxic substances impede the development of desirable species.

Subclass D indicates that forestland use and management are limited by a restricted rooting depth. The rooting depth is restricted by hard bedrock, a hardpan, or other restrictive layers in the soil.

Subclass C indicates that forestland use and management are limited by the kind or amount of clay in the upper part of the soil.

Subclass S indicates that forestland use and management are limited by sandy soil, a low available water capacity, and a normally low content of available plant nutrients. The use of equipment is limited during dry periods.

Subclass F indicates that forestland use and management are limited by a high content of rock fragments that are larger than 2 millimeters and smaller than 10 inches. This subclass includes flaggy soils.

Subclass R indicates that forestland use and management are limited by excessive slope.

Subclass A indicates that no significant limitations affect forestland use and management.

Forestland Management and Productivity

Information about the management and productivity of the forested map units in the survey area is given in the “Forestland Management” and “Forestland Productivity” tables.

Management Concerns

In the “Forestland Management” table, the soils are rated for erosion hazard, equipment limitation, seedling mortality, windthrow hazard, and plant competition.

Erosion hazard is *slight* if there is little or no hazard of erosion, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive soil loss.

Equipment limitation is *slight* if the use of equipment is not limited to a particular kind of equipment or time of year; *moderate* if there is a short seasonal limitation or a need for some modification in the management of equipment; and *severe* if there is a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings are for seedlings from good planting stock that are properly planted during a period of average rainfall. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Windthrow hazard is *slight* if trees in wooded areas are not expected to be blown down by commonly occurring winds, *moderate* if some trees are blown down during periods of excessive soil wetness and strong winds, and *severe* if many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Plant competition is *slight* if there is little or no competition from other plants; *moderate* if plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe* if plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

Potential Productivity

The potential productivity of merchantable, or *common trees*, is expressed as a site index, which is described under the heading “Ordination Class Symbol.” Commonly grown trees are those that forestland managers generally favor in intermediate or improvement cuttings. They are selected based on growth rate, quality, value, and marketability.

The column, *Trees that stands are commonly managed for*, in the “Forestland Productivity” table lists trees that are suitable for commercial wood production and that are suited to the soils.

Main Forest Access Road Limitations and Hazards

The major management concerns affecting the use of the detailed soil map units in the survey area for forest access roads are listed in the “Main Forest Access Road Limitations and Hazards” table. The significance of each limitation or hazard and the criteria used to determine the limitation or hazard are described in this section.

Areas of rock outcrop and *depth to bedrock* can increase the cost of road construction and influence route planning. Constructing roads is difficult because of the need for rock removal and the need for additional soil material to provide a suitable road surface.

Boulders increase the cost of road construction and influence route planning. Construction is difficult mainly because of the need for extraction and disposal of the boulders.

Dustiness of the road surface material may cause safety problems and accelerate equipment wear. Dust-abatement measures are needed during dry periods.

Flooding in the area where a road is constructed may restrict use, result in damage to the roadway, and result in the sedimentation of waterways. The hazard of flooding can be reduced by installing a drainage system, elevating the roadbed, and using riprap and diversions.

Low soil strength of the soil material used to construct the road surface can result in rutting, in drainage problems, and in poor trafficability during wet periods. The road should be used only during dry periods or when the surface is frozen. Surfacing with material of suitable strength and installing a drainage system can help to overcome this limitation.

Roadbed material that has a high *shrink-swell potential* shrinks and swells markedly during dry and

wet periods. Excessive shrinking and swelling can damage the road surface or other features, such as bridge abutments, culverts, and erosion-control structures.

A steep *slope* results in increased construction and maintenance costs and increased sedimentation because of the large cuts necessary to create an adequate roadbed. Seeding the cut slope to suitable vegetation minimizes sedimentation. Large cuts can increase instability of the slope. Where slumping is a hazard, slope failure can become a significant maintenance and environmental problem.

Slumping causes safety problems and increases maintenance costs. Frequent clearing of slumped soil in the roadbed or rebuilding of the roadway may be needed to keep the road serviceable and drainage systems functioning.

Stones cause problems in maintaining a smooth road surface that has good trafficability. Unless the stones are removed, additions of suitable stone-free material may be needed when the road is surfaced.

The erodibility of the soil material in the roadbed influences the probability of *water erosion* resulting from the channeling of runoff in the roadway. Erosion can result in the sedimentation of streams. It can be controlled by reducing road grades and controlling runoff onto and off of the road surface through the installation of drainage measures.

Roads built across soils that have a *water table* may require substantial ballast, fabric, internal drainage systems, and other measures that maintain a road surface that has good trafficability. Construction and use of the road only during periods when the water table is not near the surface or when the road is frozen help to maintain trafficability and reduce the potential for site damage.

Following is an explanation of the criteria used to determine the limitations or hazards.

Areas of rock outcrop—Rock outcrop is a named component of the map unit.

Areas of rubble land—Rubble land is a named component of the map unit.

Boulders—The terms describing the texture within a depth of 24 inches include a bouldery modifier, or the soil is a bouldery phase.

Depth to rock—Hard bedrock is within a depth of 60 inches.

Dustiness—The surface layer is silt, silt loam, loam, or very fine sandy loam.

Flooding—The component of the map unit is occasionally flooded or frequently flooded.

Low soil strength—The component of the map unit has one of the following Unified classifications

(ASTM, 1993) within the 60-inch profile: ML, CL, MH, CH, OL, PT, or GC.

Shrink-swell potential—The component of the map unit has a high shrink-swell potential in a layer that is at least 10-inches thick and is within 40 inches of the surface.

Slope—The upper slope limit is more than 35 percent.

Slumping—The component of the map unit meets the requirements for low soil strength and has slopes of more than 35 percent.

Stones—The terms describing the texture within a depth of 24 inches include a very stony or extremely stony modifier, or the soil is a very stony or extremely stony phase.

Water erosion—The surface K factor multiplied by the upper slope limit is more than 10.

Water table—The component of the map unit has a water table within a depth of 60 inches.

Recreation

Soils of the survey area are rated in the “Recreational Development” table according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, the access to water, the potential water impoundment sites, and either the access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. Soils are rated based on soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities. These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an

adequate cover of vegetation. Soils are rated based on soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. These areas should require little or no cutting and filling during site preparation. Soils are rated based on properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, not dusty when dry, and not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require

major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

The information in the "Recreational Development" table can be supplemented by other information in

this survey, for example, interpretations for dwellings without basements and for local roads and streets in the "Building Site Development" table and interpretations for septic tank absorption fields in the "Sanitary Facilities" table.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Elements of Wildlife Habitat

The following paragraphs describe the elements of wildlife habitat.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife. Examples of these crops grown in the survey area are barley, oats, wheat, and, occasionally, oil seed crops such as buckwheat, canola, and sunflower.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples of grasses and legumes in the survey area are alfalfa, brome, clover, meadow fescue, orchardgrass, reed canarygrass, timothy, and trefoil.

Wild herbaceous plants are native or naturally established forbs, grasses, and grasslikes that provide food and cover for wildlife. Examples of wild herbaceous plants in the survey area are American licorice, American vetch, basin wildrye, geranium, goldenrod, Idaho fescue, lupine, milkvetch, needlegrass, prairie clover, sedge, sunflower, and wheatgrass.

The major soil properties affecting the growth of forage and grain crops and wild herbaceous plants are amount of water available to plants, depth of the root zone, flooding, salinity or sodicity, texture of the surface layer, and wetness. The length of the growing season also is important.

Deciduous trees and woody understory produce bark, buds, catkins, foliage, nuts or other fruit, and twigs that wildlife eat. Examples of deciduous trees and woody understory in the survey area are antelope huckleberry, birch, bitterbrush, grouse

whortleberry, mountain mahogany, Oregongrape, quaking aspen, Rocky Mountain maple, skunkbush sumac, and willow. Examples of fruit-producing shrubs in the survey area that are suitable for planting on soils that have good potential for these plants are American plum, chokecherry, hawthorn, honeysuckle, redosier dogwood, rose, russet and silver buffaloberry, and serviceberry.

Coniferous plants are cone-bearing trees, shrubs, or ground covers that provide habitat or supply food in the form of browse, fruitlike cones, or seed. Examples of coniferous plants in the survey area are Douglas-fir; limber and lodgepole pine; and common, horizontal, and Rocky Mountain juniper.

The major soil properties affecting the growth of coniferous and deciduous trees and shrubs are amount of water available to plants, depth of the root zone, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of wetland plants in the survey area are bulrush; cattail; rush; sedge; smartweed; waterplantain; and some grasses, such as mannagrass, reed canarygrass, and reedgrass.

The major soil properties affecting wetland plants are acidity or alkalinity, slope, texture of the surface layer, and wetness.

Shallow-water areas have an average depth of less than 5 feet. These areas, either naturally wet or created by dams, levees, or water-control measures in marshes or streams, are useful as habitat for some wildlife species. Examples of shallow-water areas in the survey area are beaver ponds and other wildlife ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments.

The major soil properties affecting shallow-water areas are depth to bedrock, permeability, slope, surface stoniness, and wetness.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, meadows, pasture, and other areas that are

overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to openland areas include cottontail rabbit, field sparrow, Hungarian partridge, killdeer, meadowlark, pheasant, red fox, sage grouse, and sharp-tailed grouse.

Habitat for woodland wildlife consists of areas of coniferous or deciduous trees and shrubs or a mixture of these and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to woodland areas include black bear, deer, elk, owl, porcupine, raccoon, ruffed grouse, thrush, tree squirrel, wild turkey, and woodpecker.

Habitat for wetland wildlife consists of open, marshy or swampy, shallow-water areas that support water-tolerant plants. Wildlife attracted to wetland areas include beaver, bittern, duck, geese, heron, kingfisher, mink, muskrat, otter, and rail.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland areas include antelope, deer, lark bunting, meadowlark, and sage grouse.

Wildlife of Sanders and Parts of Lincoln and Flathead Counties

Habitat quality and interspersions determine wildlife population levels. Suitability of a particular habitat for a wildlife species depends greatly on the nature of the plant communities present. Prevailing land use practices and management determine the quantity, quality, and distribution of plant communities. To some extent, the soils of the area govern these factors.

Rating soils for their ability to produce vegetative elements for wildlife habitat does not take into account local climatic influences, present use of soils, juxtaposition of habitat types or elements, or present distribution of wildlife species. For these reasons, the selection and suitability of an area for wildlife habitat development require onsite evaluation.

The survey area provides a variety of wildlife habitats, including coniferous forests, irrigated and nonirrigated cropland, marshes, mountainous areas of rolling foothills to glaciated peaks, ponds, rangeland, reservoirs, riparian woodland, rivers, and streams.

Rocky Mountain elk occur in all of the mountain ranges of the survey area. Elk habitat is classified as either grass or browse ranges based on the availability of winter food. Browse ranges

predominate in the mountains of the survey area. Elk spend summer and fall at relatively high elevations, where moist, lush forests are interspersed with grassy mountain meadows. They begin to move to lower elevations late in fall, depending upon the amount of snowfall. In forested environments, elk thrive during the shrub stage of plant succession. Elk numbers are lower in areas where coniferous trees grow in old burns and clearcuts and replace browse and herbaceous plants. Elk prefer bunchgrass ranges but are adaptable and also occupy timbered mountains and canyons.

Moose are most commonly found in the northern part of Sanders County, as well as west of the town of Helmville and along the eastern and western portions of the southern third of the survey area. They graze high-elevation spruce and fir forests extensively in summer and fall. As winter snows accumulate on high slopes, moose move along drainages to lower-elevation winter ranges where they reach their greatest population densities. Moose are primarily browsers in winter, utilizing a variety of willows and other deciduous shrubs. During summer, they often feed on aquatic plants of marshes, rivers, and streams.

Both mule deer and white-tailed deer occupy the survey area. Mule deer are especially numerous at mid and high elevations and along the foothills of major mountain ranges. White-tailed deer generally inhabit the lower areas, such as foothills, stream bottoms, and valleys. Their winter ranges are along the footslopes and south-facing slopes of mountains throughout the survey area.

Populations of Rocky Mountain bighorn sheep reside near Perma on the Flathead Indian Reservation, along the Clark Fork River, and on the National Bison Range.

A herd of about 300 bison, as well as populations of Rocky Mountain goats, inhabits the National Bison Range. Rocky Mountain goats also occupy the Thompson River area.

Black bear are common in forests of the northwest. Grizzly bear inhabit the Cabinet Range.

Bald and golden eagles, along with osprey, inhabit the valley bottoms in the major drainages.

Merriam's turkey inhabit the west end of the survey area from Thompson Falls to the Idaho state line. Turkey habitat can be enhanced by interspersing cropland and pasture with brushy drainageways and woodland.

Hungarian partridge and ring-necked pheasant inhabit farmlands throughout the survey area. A varied land use pattern, including annual weeds,

brushy cover, cattail marshes, irrigated and nonirrigated cropland, and small grains supports these introduced game birds.

Land management practices beneficial to Hungarian partridge and ring-necked pheasant include proper grazing use, protection of woody cover from burning or eradication, and retention of stubble and waste grain during winter through elimination of fall tillage. Field hedgerows and shelterbelts provide woody cover and winter food supply for both species. Bottomlands that support habitat for ring-necked pheasant include brushy ditchbanks, brushy drainageways, cattail marshes, and irrigated and nonirrigated cropland.

Three species of forest-dwelling grouse—blue, spruce, and ruffed—occur in the coniferous forests and riparian woodlands of the survey area. A variety of habitats, such as brushy draws, mixed forests, and stream bottoms, are important to forest grouse throughout the seasons. Blue and spruce grouse winter at high elevations. In early spring, they descend to semi-open timber areas for breeding, nesting, and rearing of chicks.

Blue grouse habitat is closely associated with the distribution patterns of Douglas-fir and true fir and the soil associations that support forests with these species as components.

Ruffed grouse inhabit the dense cover of coniferous and deciduous shrubs and trees,

especially along stream courses. Adult ruffed grouse may spend most of their lives in an area of less than 2 square miles.

Many marshes, ponds, potholes, reservoirs, rivers, and sloughs scattered throughout the survey area provide habitat for an abundance of waterfowl during spring and fall migrations and during the summer production period. Ducks, geese, and a variety of marsh and shore birds use these bodies of water for resting, nesting, and rearing of young.

Beaver, mink, and muskrat inhabit the principal watercourses. Badger, bobcat, coyote, ground squirrel, and a variety of small mammals occur throughout the survey area.

Populations of game and nongame species can be enhanced by using conservation practices to improve their habitat. These practices include development of odd or irregularly shaped areas in and adjacent to farmland to provide food and cover, protection of habitat from fire or grazing, and establishment of woody vegetation to provide winter shelter. Wildlife habitat may also be enhanced through application of commonly employed conservation practices including minimum tillage, planned grazing systems, pond construction, shelterbelts and field windbreaks, and stripcropping.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. Ratings are based on observed soil performance and on estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial,

industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

Additional interpretations can be made using the information in the tables, along with soil maps, soil descriptions, and other data provided in this survey.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

The "Building Site Development" table shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, open ditches, utility lines, and other purposes. Ratings are based on soil properties, site features, and observed soil performance. Ease of digging,

filling, and compacting is affected by the depth to bedrock, to a cemented pan, or to a very firm dense layer; stone content; soil texture; and slope. Depth to a seasonal high water table and susceptibility of the soil to flooding affect the time of year that excavations can be made. Soil texture and depth to the water table affect the resistance of the excavation walls or banks to sloughing or caving.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for dwellings without basements, dwellings with basements, and small commercial buildings without basements. Ratings are based on soil properties, site features, and observed soil performance. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. Ratings are based on soil properties, site features, and observed soil performance. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Ratings are based on soil properties, site features, and observed soil performance. Soil reaction; a high water table; depth to bedrock or to a cemented pan; available water capacity in the upper 40 inches; and content of salts, sodium, and sulfidic materials affect plant growth. Flooding; wetness; slope; stoniness; and amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The "Sanitary Facilities" table shows the degree and the kind of soil limitations that affect septic tank

absorption fields, sewage lagoons, and sanitary landfills. This table also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight*, *moderate*, or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good*, *fair*, and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. Soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

Ratings are based on soil properties, site features, and observed soil performance. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock, or a cemented pan, interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a

nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The "Sanitary Facilities" table gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. Ratings are based on soil properties, site features, and observed soil performance. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. Waste is spread, compacted, and covered daily with a thin layer of soil, excavated from the trench. When the trench is full, a final cover of soil material at least 2-feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. Waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2-feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ratings in the "Sanitary Facilities" table are based on soil properties, site features, and observed soil performance. Permeability, depth to bedrock or to a cemented pan, a high water table,

slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. Soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. Soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, the most organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They are also important when soil is used as a medium for treatment and disposal of organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

Use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area, then environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste; municipal sewage sludge; use of wastewater

for irrigation; and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available from local Natural Resources Conservation Service or Cooperative Extension Service offices.

Construction Materials

The “Construction Materials” table gives information about the soils as a source of roadfill, sand, gravel, and topsoil. Soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the “Construction Materials” table, soils are rated as a source of roadfill for low embankments, generally less than 6-feet high and less exacting in design than higher embankments.

Ratings are for soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The “Engineering Index Properties” table provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. Soil performance after it is stabilized with lime or cement is not considered in the ratings.

Ratings are based on soil properties, site features, and observed soil performance. Thickness of suitable material is a major consideration. Ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, slopes of more than 25 percent, or a water table at a depth of less than

1 foot. They may have layers of suitable material, but it is less than 3-feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the “Construction Materials” table, only the probability of finding material in suitable quantity in or below the soil is evaluated. Suitability of the material for specific purposes is not evaluated nor are factors that affect excavation of the material.

Properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), thickness of suitable material, and content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the “Engineering Index Properties” table.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3-feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Fragments of soft bedrock, such as shale and siltstone, are not considered sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Reclamation potential of the borrow area is also evaluated.

Toxic material and such properties as soil reaction, available water capacity, and fertility affect plant growth. Slope, the water table, rock fragments, soil texture, and thickness of suitable material affect ease of excavating, loading, and spreading. Slope, the water table, rock fragments, bedrock, and toxic material affect reclamation of the borrow area.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils; loamy soils that have a relatively high content of clay; soils that have only 20 to 40 inches of suitable material; soils that have an appreciable amount of gravel, stones, or soluble salts; or soils that have slopes of 8 to 15 percent. Soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey; have less than 20 inches of suitable material; have a large amount of gravel, stones, or soluble salts; have slopes of more than 15 percent; or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The “Water Management” table gives information about soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. Limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. Seepage potential is determined by permeability of the soil and depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20-feet high, constructed to impound water or to protect land against overflow. In the “Water Management” table, soils are rated as a source of material for embankment fill. Ratings apply to soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

Ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the

embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material and trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil affect excavated ponds. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving affect excavating and grading and the stability of ditchbanks. Productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. Depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope affect the design and management of an irrigation system. Large stones and depth to bedrock or to a cemented pan affect the construction of a system. Depth of the root zone, the amount of salts or sodium, and soil reaction affect the performance of a system.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. Restricted rooting depth, severe hazard of soil blowing or water erosion, excessively coarse texture,

and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock

or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of a soil survey. Data and estimates of soil and water features, listed in the tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

Estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The "Engineering Index Properties" table gives estimates of the engineering classification and of the range of index properties for major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. Soil series descriptions in Part I of this survey give the range in depth and information on other properties of each layer.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles

coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." The "Glossary" defines textural terms.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 based on grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 based on visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter and larger than 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight.

The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The “Physical Properties of the Soils” and “Chemical Properties of the Soils” tables show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the “Physical Properties of the Soils” table.

Depth to the upper and lower boundaries of each layer is indicated. Range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell

potential, permeability, plasticity, ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $\frac{1}{3}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the “Physical Properties of the Soils” table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. Capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many

soils. For others, swelling was estimated based on the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the "Physical Properties of the Soils" table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. It affects the available water capacity, infiltration rate, and tilth. Organic matter is a source of nitrogen and other nutrients for crops.

Erosion factors are shown in the "Physical Properties of the Soils" table as the K factor (K and Kf) and the T factor. *Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor K indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil

blowing in cultivated areas. The groups indicate the susceptibility of soils to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to soil blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of

surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

The following paragraphs describe the columns in the "Chemical Properties of the Soils" table.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation; it is expressed, in millimhos per centimeter at 25 degrees C, as the electrical conductivity of the saturation extract. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by irrigation water quality and by water application frequency. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water

extracted from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by increased dispersion of organic matter and clay particles, reduced permeability and aeration, and general degradation of soil structure.

Water Features

The "Water Features" table gives estimates of several important water features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. Soil properties affecting the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include depth to a seasonal high water table, intake rate, permeability after prolonged wetting, and depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. They consist chiefly of very deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. They consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. They consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. They consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near

the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered ponding.

The “Water Features” table gives the *frequency* and *duration* of flooding and the months of the year when flooding is most likely to occur. Frequency, duration, and probable months of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year when flooding is most likely to occur is expressed in *months*. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. A seasonal high water table is at least 6-inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the “Water Features” table are *water table depth*, *kind of water table*, and *months* of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time is allowed for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column, *water table depth*, indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates the water table is above the surface of the soil. *> than 6.0* indicates the water table is below a depth of 6 feet or it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, water is removed only by percolation, transpiration, or evaporation. *Ponding duration* is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. *Maximum ponding depth* is the depth of the ponded surface water.

Soil Features

The “Soil Features” table gives estimates of several important soil features used in land-use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. It generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. The “Soil Features” table shows the expected initial subsidence, which generally is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors

considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well-drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates the soil is rarely susceptible to formation of ice lenses; a *moderate* potential indicates the soil is susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength; and a *high* potential indicates the soil is highly susceptible to formation of ice lenses, resulting in frost heave and subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The corrosion rate of uncoated steel is related to such factors as

soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The corrosion rate of concrete is based mainly on sulfate and sodium content, texture, moisture content, and soil acidity.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For *uncoated steel*, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For *concrete*, the risk of corrosion, also expressed as *low*, *moderate*, or *high*, is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse-grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion. In areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown, and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well-drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet, at or near the surface, during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well-preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited.

Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser

depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material.

Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties

include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well-sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine-grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding

lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well-decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots.

For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile.

Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse-grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. (See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II).

The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the

soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Sand. As a soil separate, individual rock or mineral fragments from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transitional zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Strippcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Tread. The relatively flat terrace surface that was cut or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These

changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

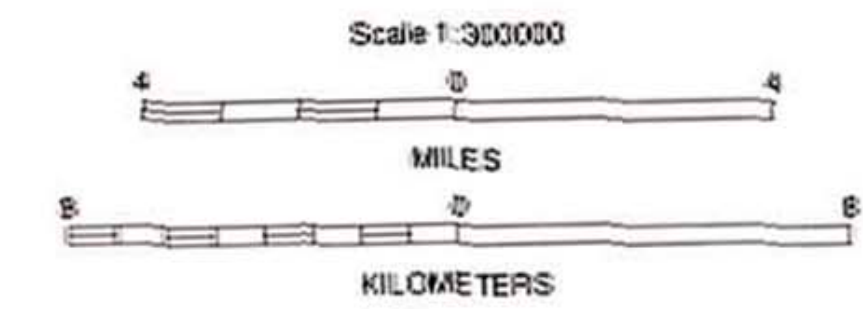
Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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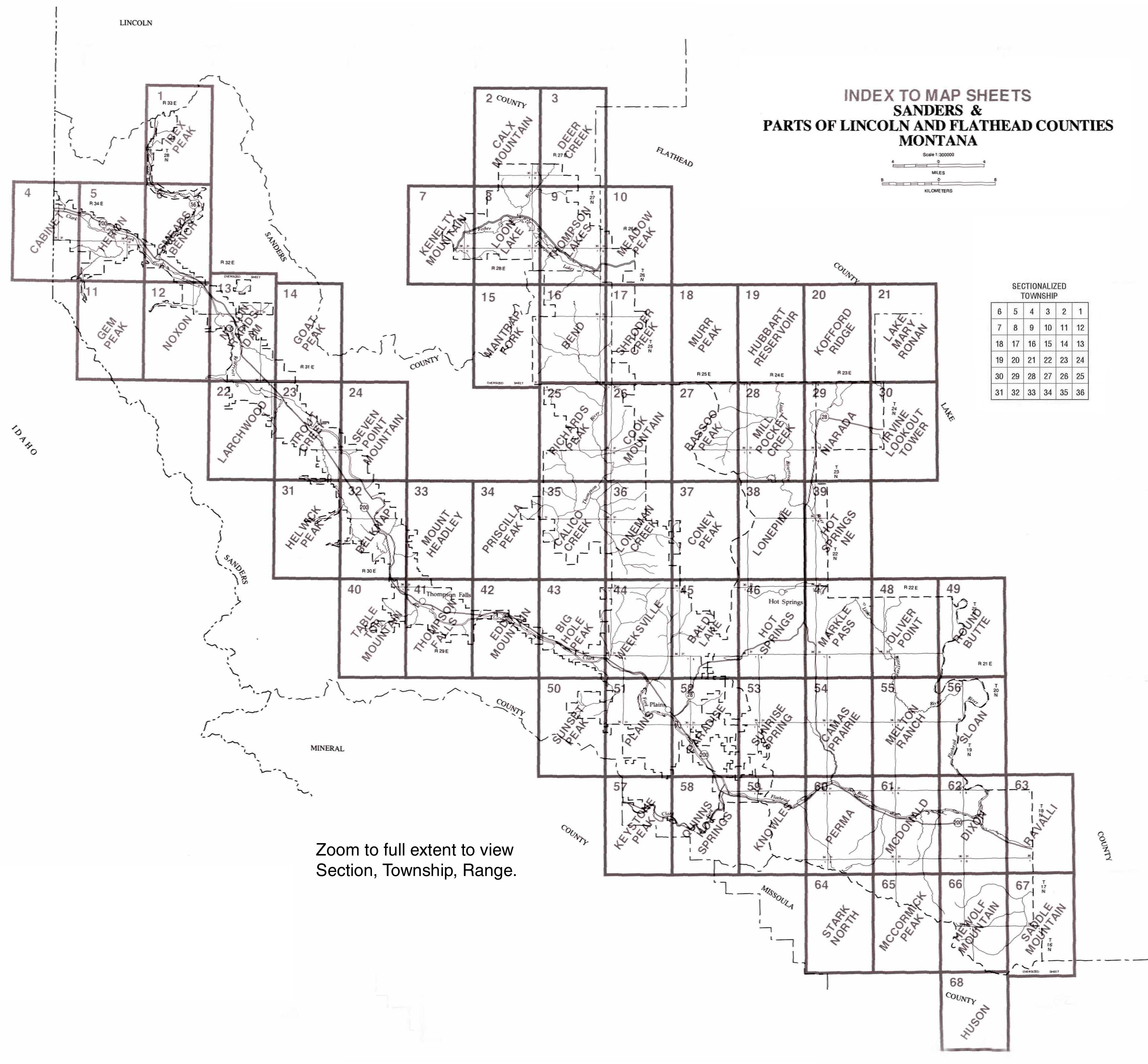
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INDEX TO MAP SHEETS SANDERS & PARTS OF LINCOLN AND FLATHEAD COUNTIES MONTANA



SECTIONALIZED
TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



Zoom to full extent to view
Section, Township, Range.

SOIL LEGEND

The publication symbols consist of field symbols. Symbols consist of numbers or a combination of numbers and letters, for example, 18A, 266D, 2, and 1823F. For the symbols designated by a number and a letter, the number designates the soil type and the letter designates the slope class. The symbols without a number designate a miscellaneous area. Map units are arranged numerically by field symbols.

SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
1A	Grantsdale silt loam, 0 to 4 percent slopes	33E	Mitten gravelly silt loam, dry, 15 to 35 percent slopes	60D	Niarada gravelly loam, cool, 4 to 15 percent slopes
2B	Moiese gravelly loam, 0 to 4 percent slopes	33F	Mitten gravelly silt loam, dry, 35 to 60 percent slopes	60E	Niarada gravelly loam, cool, 15 to 30 percent slopes
3A	Gird silt loam, 0 to 4 percent slopes	34C	Krause gravelly silt loam, 2 to 8 percent slopes	60F	Niarada gravelly loam, cool, 30 to 60 percent slopes
3B	Gird silt loam, 4 to 8 percent slopes	34E	Winfall gravelly loam, 8 to 30 percent slopes	61B	Scotmont fine sandy loam, 0 to 4 percent slopes
4A	Lamoose loam, moist, 0 to 2 percent slopes	34F	Winfall gravelly loam, 30 to 50 percent slopes	61D	Scotmont fine sandy loam, 4 to 15 percent slopes
5B	Whitearth silt loam, 0 to 4 percent slopes	35C	McCollum fine sandy loam, 4 to 8 percent slopes	61F	Flott gravelly loam, 30 to 50 percent slopes
6A	Murrstead mucky peat, 0 to 2 percent slopes	35E	Courville gravelly silt loam, 8 to 30 percent slopes	62B	Beaverdump gravelly loam, 0 to 4 percent slopes
6B	Sacheen loamy fine sand, dry, 2 to 8 percent slopes	35F	Courville gravelly silt loam, 30 to 50 percent slopes	62D	Beaverdump gravelly loam, 4 to 15 percent slopes
6E	Sacheen loamy fine sand, dry, 8 to 30 percent slopes	36D	Rumblecreek gravelly loam, 4 to 15 percent slopes	62F	Flott gravelly loam, dry, 30 to 50 percent slopes
7B	Jocko gravelly loam, 0 to 4 percent slopes	36E	Rumblecreek gravelly loam, 15 to 30 percent slopes	64B	Lionwood loam, 0 to 4 percent slopes
8A	Hewolf gravelly loam, 0 to 2 percent slopes	36F	Rumblecreek gravelly loam, 30 to 50 percent slopes	64E	Finleypoint gravelly loam, moist, 15 to 30 percent slopes
9A	Lamoose silt loam, 0 to 2 percent slopes	37D	Rumblecreek gravelly loam, dry, 4 to 15 percent slopes	64F	Finleypoint gravelly loam, moist, 30 to 60 percent slopes
10A	Bohnlly silt loam, 0 to 2 percent slopes	37E	Rumblecreek gravelly loam, dry, 15 to 30 percent slopes	65A	Larchpoint silt loam, 0 to 2 percent slopes
11A	Bolack silt loam, 0 to 2 percent slopes	37F	Rumblecreek gravelly loam, dry, 30 to 50 percent slopes	66A	Bigbeaver silt loam, 0 to 2 percent slopes
12A	Marklepass silty clay loam, 0 to 2 percent slopes	39F	Beeskove gravelly loam, 35 to 60 percent slopes	66F	Battlebutte gravelly loam, 30 to 60 percent slopes
12C	Auggie silt loam, 2 to 8 percent slopes	40E	Holloway gravelly silt loam, 15 to 35 percent slopes	67A	Glaciercreek gravelly silt loam, cool, 0 to 2 percent slopes
12E	Auggie silt loam, 8 to 30 percent slopes	40F	Holloway gravelly silt loam, 35 to 60 percent slopes	67C	Glaciercreek gravelly silt loam, cool, 2 to 8 percent slopes
13A	Round Butte silty clay loam, 0 to 2 percent slopes	40G	Holloway-Rubble land complex, 40 to 70 percent slopes	67D	Koyokee gravelly loam, 4 to 15 percent slopes
13B	Round Butte silty clay loam, 2 to 8 percent slopes	41B	Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes	67E	Koyokee gravelly loam, 15 to 30 percent slopes
14A	Belton silt loam, 0 to 2 percent slopes	41C	Sacheen loamy fine sand, 2 to 8 percent slopes	68C	Upsata gravelly silt loam, 2 to 8 percent slopes
14B	Belton silt loam, 2 to 8 percent slopes	41E	Sacheen loamy fine sand, 8 to 30 percent slopes	68E	Upsata gravelly silt loam, 8 to 30 percent slopes
14D	Belton silt loam, 8 to 15 percent slopes	41F	Sacheen loamy fine sand, 30 to 60 percent slopes	68F	Upsata gravelly silt loam, 30 to 60 percent slopes
14E	Belton silt loam, 15 to 35 percent slopes	42B	Selon fine sandy loam, 0 to 4 percent slopes	69B	Meadowpass gravelly loam, 2 to 8 percent slopes
15B	Lonepine silt loam, 2 to 8 percent slopes	42D	Selon fine sandy loam, 4 to 15 percent slopes	69C	Tamarack loam, 2 to 8 percent slopes
15D	Lonepine-Vincom silt loams, 4 to 15 percent slopes	42E	Holloway gravelly silt loam, cool, 15 to 35 percent slopes	70B	Half Moon silt loam, 2 to 8 percent slopes
17B	Kerrdam silt loam, 0 to 4 percent slopes	42F	Holloway gravelly silt loam, cool, 35 to 60 percent slopes	70D	Half Moon silt loam, 8 to 15 percent slopes
17D	Kerrdam silt loam, 4 to 15 percent slopes	42G	Holloway, cool-Rock outcrop complex, 40 to 70 percent slopes	70E	Half Moon silt loam, 15 to 30 percent slopes
17E	Kerrdam silt loam, 15 to 35 percent slopes	43E	Waldbillig gravelly silt loam, 8 to 30 percent slopes	71D	Loonlake gravelly silt loam, 4 to 15 percent slopes
18B	Dryfork silt loam, 0 to 4 percent slopes	44D	Waldbillig gravelly silt loam, cool, 4 to 15 percent slopes	71E	Loonlake gravelly silt loam, 15 to 30 percent slopes
19F	Vincom silt loam, 35 to 60 percent slopes	45D	Phillcher gravelly silt loam, 8 to 30 percent slopes	72A	Blacklake mucky peat, 0 to 1 percent slopes
20E	Winkler gravelly loam, 15 to 35 percent slopes	45G	Phillcher-Rock outcrop complex, 40 to 70 percent slopes	72B	Millpocket silty clay loam, 2 to 8 percent slopes
20F	Winkler gravelly loam, 35 to 60 percent slopes	46F	Felan gravelly silt loam, 35 to 60 percent slopes	73A	Meadowpeak silt loam, 0 to 2 percent slopes
20G	Winkler-Rubble land complex, 40 to 70 percent slopes	47C	Elkrock cobbly silt loam, 2 to 6 percent slopes, stony	74A	Blackcreek silt loam, 0 to 2 percent slopes
21B	Totellake gravelly loam, 2 to 8 percent slopes	47D	Elkrock gravelly silt loam, 4 to 15 percent slopes	75B	Tallcreek silt loam, 0 to 4 percent slopes
21D	Totellake gravelly loam, 8 to 15 percent slopes	47E	Petty gravelly loam, 8 to 30 percent slopes	76E	Felan gravelly silt loam, moist, 15 to 35 percent slopes
21E	Combest gravelly silt loam, 15 to 35 percent slopes	47F	Petty gravelly loam, 30 to 50 percent slopes	76F	Felan gravelly silt loam, moist, 35 to 60 percent slopes
21F	Combest gravelly silt loam, 35 to 60 percent slopes	47G	Petty-Rubble land complex, 40 to 70 percent slopes	77D	Beeskove gravelly loam, moist, 4 to 15 percent slopes
22C	Courville gravelly silt loam, 2 to 8 percent slopes	48C	Ashworth gravelly silt loam, 2 to 8 percent slopes	77E	Beeskove gravelly loam, moist, 15 to 35 percent slopes
22E	Winkler gravelly sandy loam, cool, 15 to 35 percent slopes	48E	Ashworth gravelly silt loam, 8 to 30 percent slopes	77F	Beeskove gravelly loam, moist, 35 to 60 percent slopes
22F	Winkler gravelly sandy loam, cool, 35 to 60 percent slopes	48F	Ashworth gravelly silt loam, 30 to 50 percent slopes	78B	Fernline silt loam, 0 to 4 percent slopes
22G	Winkler, cool-Rubble land complex, 40 to 70 percent slopes	50B	Bigarm gravelly loam, 2 to 8 percent slopes	78D	Fernline silt loam, 4 to 15 percent slopes
23D	Yourame gravelly loam, 4 to 15 percent slopes	50D	Bigarm gravelly loam, 8 to 15 percent slopes	80F	Sharrott-Rubble land-Rock outcrop complex, 15 to 60 percent slopes
23E	Yourame gravelly loam, 15 to 30 percent slopes	50E	Bigarm gravelly loam, 15 to 30 percent slopes	81E	Noxlin silt loam, 8 to 35 percent slopes, stony
23F	Yourame gravelly loam, 30 to 50 percent slopes	50F	Bigarm cobbly loam, 30 to 60 percent slopes	82B	Bignell gravelly loam, 0 to 4 percent slopes
24B	Dubay silt loam, 0 to 4 percent slopes	51A	Horseplains-Riverwash complex, 0 to 2 percent slopes	82D	Bignell gravelly loam, 4 to 15 percent slopes
24D	Dubay silt loam, 4 to 15 percent slopes	52D	Bigarm gravelly loam, cool, 4 to 15 percent slopes	82E	Bignell gravelly loam, 15 to 35 percent slopes
24E	Repp gravelly loam, 15 to 35 percent slopes	52E	Bigarm gravelly loam, cool, 15 to 30 percent slopes	82F	Sharrott, cool-Rock outcrop-Rubble land complex, 15 to 60 percent slopes
24F	Repp gravelly loam, 35 to 60 percent slopes	52F	Bigarm cobbly loam, cool, 30 to 60 percent slopes	83B	Backroad gravelly silt loam, 0 to 4 percent slopes
25D	Wildgen gravelly loam, 4 to 15 percent slopes	53F	Hogsby-Rubble land-Rock outcrop complex, 15 to 60 percent slopes	83D	Backroad gravelly silt loam, 4 to 15 percent slopes
25E	Wildgen gravelly loam, 15 to 30 percent slopes	54C	Yellowbay gravelly loam, 2 to 8 percent slopes	84E	Lozeau gravelly loam, 8 to 30 percent slopes
25F	Wildgen gravelly loam, 30 to 50 percent slopes	54E	Finleypoint gravelly loam, 15 to 30 percent slopes	84F	Lozeau gravelly loam, 30 to 50 percent slopes
26F	Repp gravelly loam, cool, 35 to 60 percent slopes	54F	Finleypoint gravelly loam, 30 to 60 percent slopes	85A	Hogheaven silt loam, 0 to 2 percent slopes
27D	Wildgen gravelly loam, dry, 4 to 15 percent slopes	55B	Yourame gravelly loam, 0 to 4 percent slopes	85B	Whitepine silt loam, 0 to 4 percent slopes
27E	Wildgen gravelly loam, dry, 15 to 30 percent slopes	55D	Niarada gravelly loam, 4 to 15 percent slopes	85D	Whitepine silt loam, 4 to 15 percent slopes
27F	Wildgen gravelly loam, dry, 30 to 50 percent slopes	55E	Niarada gravelly loam, 15 to 30 percent slopes	86C	Bata gravelly silt loam, 2 to 8 percent slopes
28B	Bemishave loam, 0 to 4 percent slopes	55F	Niarada gravelly loam, 30 to 60 percent slopes	86E	Bata gravelly silt loam, 8 to 30 percent slopes
28E	Eaglewing gravelly loam, 8 to 30 percent slopes	56A	Bowlake gravelly loam, 0 to 2 percent slopes	87E	Pashua gravelly loam, 8 to 30 percent slopes
28F	Eaglewing gravelly loam, 30 to 50 percent slopes	56B	Bowlake-Minesinger gravelly loams, 2 to 8 percent slopes	87F	Stevie gravelly silt loam, 35 to 60 percent slopes
29E	Yourame gravelly loam, dry, 15 to 30 percent slopes	57D	Minesinger gravelly loam, 4 to 15 percent slopes	88C	Dewberry silt loam, 2 to 8 percent slopes
29F	Yourame gravelly loam, dry, 30 to 50 percent slopes	57E	Minesinger stony loam, 15 to 30 percent slopes	88E	Dewberry gravelly silt loam, 8 to 45 percent slopes
30E	Tevis gravelly loam, 15 to 35 percent slopes	58B	McDonald silt loam, 2 to 8 percent slopes	89B	Iffgulch clay, 0 to 4 percent slopes
30F	Tevis gravelly loam, 35 to 60 percent slopes	58D	McDonald silt loam, 8 to 15 percent slopes	89E	Selway gravelly sandy loam, 8 to 30 percent slopes
30G	Tevis-Rubble land complex, 40 to 70 percent slopes	58E	McDonald silt loam, 15 to 30 percent slopes	90A	Camascreek silt loam, 0 to 2 percent slopes
31E	Tevis gravelly loam, dry, 15 to 35 percent slopes	58F	Waldbillig gravelly silt loam, moist, 30 to 50 percent slopes	91B	Biglake gravelly loam, 0 to 8 percent slopes
31F	Tevis gravelly loam, dry, 35 to 60 percent slopes	59D	Minesinger stony loam, cool, 4 to 15 percent slopes	91D	Stargulch very fine sandy loam, 4 to 15 percent slopes
32E	Mitten gravelly silt loam, 15 to 35 percent slopes	59E	Minesinger stony loam, cool, 15 to 30 percent slopes	92C	Oldtrail gravelly sandy loam, 0 to 8 percent slopes
32F	Mitten gravelly silt loam, 35 to 60 percent slopes	59F	Minesinger stony loam, cool, 30 to 50 percent slopes	93A	Horseplains fine sandy loam, 0 to 2 percent slopes
32G	Mitten-Rubble land complex, 40 to 70 percent slopes	60B	Bonnash gravelly silt loam, 0 to 4 percent slopes	94A	Revais silt loam, 0 to 2 percent slopes

SOIL LEGEND

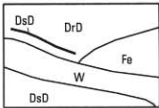
SYMBOL	NAME	SYMBOL	NAME	SYMBOL	NAME
94D	Berray silt loam, 4 to 15 percent slopes	200	Riverwash	542F	Yellowbay-Selon-Bemishave complex, 15 to 60 percent slopes
95A	Gardencreek silty clay loam, 0 to 2 percent slopes	211G	Combest-Rubble land complex, 40 to 70 percent slopes	543F	Yellowbay-Selon-Sacheen complex, 15 to 60 percent slopes
96A	Clearcreek silt loam, 0 to 2 percent slopes	213A	Round Butte-Selow complex, 0 to 2 percent slopes	582E	Waldbillig-Holloway gravelly silt loams, moist, 15 to 30 percent slopes
96D	Courvash cobbly silt loam, 4 to 15 percent slopes	213B	Round Butte-Selow complex, 2 to 8 percent slopes	582F	Waldbillig-Holloway gravelly silt loams, moist, 30 to 50 percent slopes
96E	Courvash cobbly silt loam, 15 to 35 percent slopes	215B	Lonepine-Round Butte complex, 2 to 8 percent slopes	631E	Rockhill-Mitten-Rock outcrop complex, 8 to 35 percent slopes
97C	Remount very gravelly loam, 2 to 12 percent slopes	217E	Kerrdam-Round Butte-Irvine complex, 8 to 35 percent slopes	632F	Rockhill-Rock outcrop complex, 15 to 60 percent slopes
97E	Remount very gravelly loam, 12 to 25 percent slopes	218D	Dryfork-Selow silt loams, 4 to 15 percent slopes	641D	Lionwood-Scotmont-Whitepine complex, 4 to 15 percent slopes
97F	Mollman gravelly loam, 30 to 50 percent slopes	221F	Courville-Rockhill-Rock outcrop complex, 30 to 50 percent slopes	641E	Lionwood-Scotmont-Whitepine complex, 15 to 35 percent slopes
98C	Doglake extremely cobbly loam, 2 to 12 percent slopes	222F	Courville gravelly silt loam, dry, 30 to 50 percent slopes	671C	Glaciercreek gravelly silt loam, 2 to 8 percent slopes
98E	Bendahl gravelly silt loam, 15 to 30 percent slopes	250E	Bigarm-Rubble land complex, 15 to 30 percent slopes	671E	Glaciercreek gravelly silt loam, 8 to 30 percent slopes
98F	Bendahl gravelly silt loam, 30 to 50 percent slopes	250F	Bigarm-Rubble land complex, 30 to 60 percent slopes	691B	Tamarack-Crystalex complex, 0 to 4 percent slopes
99A	McLangor-Meadowpeak complex, 0 to 2 percent slopes	251A	Horseplains fine sandy loam, gravelly substratum, 0 to 2 percent slopes	691D	Tamarack-Crystalex complex, 4 to 15 percent slopes
99C	Lesier gravelly silt loam, 2 to 8 percent slopes	252E	Bigarm, cool-Rubble land complex, 15 to 30 percent slopes	691E	Tamarack-Crystalex complex, 15 to 30 percent slopes
99E	Lesier gravelly silt loam, 8 to 30 percent slopes	252F	Bigarm, cool-Rubble land complex, 30 to 60 percent slopes	691F	Tamarack-Crystalex complex, 30 to 60 percent slopes
100	Rock outcrop-Rubble land complex	254F	Finleypoint-Rubble land complex, 30 to 60 percent slopes	692B	Tamarack fine sandy loam, 0 to 4 percent slopes
103B	Gird-McCollum complex, 0 to 4 percent slopes	261C	Gird-McCollum complex, 4 to 8 percent slopes	731A	Meadowpeak-Firetower silt loams, 0 to 2 percent slopes
105B	Whitearth-Slickspots complex, 2 to 8 percent slopes	266E	Battlebutte-Bigdraw gravelly loams, 15 to 30 percent slopes	732A	Meadowpeak silt loam, 0 to 2 percent slopes, frequently flooded
106D	Sacheen-Dune land complex, 4 to 15 percent slopes	291B	Half Moon silt loam, cool, 2 to 8 percent slopes	771G	Beeskove-Mollman-Rock outcrop complex, 40 to 80 percent slopes
112A	Marklepass-Slickspots complex, 0 to 4 percent slopes	291D	Half Moon silt loam, cool, 8 to 15 percent slopes	781D	Fernline-Cabinet silt loams, 4 to 15 percent slopes
113D	Round Butte-Irvine silty clay loams, 4 to 15 percent slopes	291E	Half Moon silt loam, cool, 15 to 35 percent slopes	781E	Fernline-Cabinet silt loams, 15 to 30 percent slopes
116E	Irvine-Round Butte silty clay loams, 8 to 35 percent slopes	291F	Half Moon silt loam, cool, 35 to 60 percent slopes	791B	Redlock-Fernline silt loams, 0 to 4 percent slopes
116F	Irvine-Lake sediment outcrop complex, 35 to 60 percent slopes	292B	McCollum fine sandy loam, 0 to 4 percent slopes	791D	Redlock-Fernline silt loams, 4 to 15 percent slopes
117E	Kerrdam-Dryfork-Vincom silt loams, 8 to 35 percent slopes	322E	Holloway gravelly silt loam, moist, 15 to 35 percent slopes	791E	Redlock-Fernline silt loams, 15 to 35 percent slopes
118B	Dryfork-Selow silt loams, 0 to 4 percent slopes	322F	Holloway gravelly silt loam, moist, 35 to 60 percent slopes	792D	Redlock-Fernline-Iffgulch complex, 0 to 15 percent slopes
118D	Dryfork-Kerrdam silt loams, 4 to 15 percent slopes	323G	Holloway, moist-Rock outcrop complex, 40 to 70 percent slopes	807A	McLangor mucky peat, 0 to 2 percent slopes
119E	Vincom-Lonepine silt loams, 15 to 35 percent slopes	341C	Krause very cobbly silt loam, 2 to 8 percent slopes	808A	Barzee mucky peat, 0 to 2 percent slopes
119F	Vincom-Lake sediment outcrop complex, 35 to 60 percent slopes	350B	Bigarm gravelly loam, alluvial, 2 to 8 percent slopes	811D	Noxlin-Fernline silt loams, 4 to 15 percent slopes, stony
120G	Winkler-Sharrott-Rubble land complex, 40 to 85 percent slopes	350D	Bigarm gravelly loam, alluvial, 8 to 15 percent slopes	821D	Combest gravelly silt loam, 4 to 15 percent slopes
122E	Winkler, cool-Sharrott, cool-Rock outcrop complex, 8 to 40 percent slopes	350E	Bigarm gravelly loam, alluvial, 15 to 30 percent slopes	824E	Dubay silt loam, 15 to 30 percent slopes
122G	Winkler, cool-Sharrott, cool-Rubble land complex, 40 to 85 percent slopes	350F	Bigarm gravelly loam, alluvial, 30 to 50 percent slopes	834F	Krause gravelly silt loam, 15 to 45 percent slopes
123D	Yourame-Wildgen gravelly loams, 8 to 30 percent slopes	351C	McCollum-Belton fine sandy loams, 4 to 8 percent slopes	842E	Selon fine sandy loam, 15 to 30 percent slopes
123E	Mocmont-Winkler complex, 8 to 35 percent slopes	351D	McCollum-Belton fine sandy loams, 8 to 15 percent slopes	842F	Selon fine sandy loam, 30 to 60 percent slopes
126G	Repp-Rock outcrop complex, 40 to 70 percent slopes	366E	Battlebutte-Bigdraw gravelly loams, moist, 8 to 30 percent slopes	858E	Waldbillig gravelly silt loam, moist, 8 to 30 percent slopes
132F	Mitten-Tevis complex, 35 to 60 percent slopes	366F	Battlebutte-Bigdraw gravelly loams, moist, 30 to 60 percent slopes	860D	Bonnash gravelly silt loam, 4 to 15 percent slopes
134E	Winfall-Courville complex, 8 to 30 percent slopes	374F	Mitten-Rock outcrop complex, 40 to 70 percent slopes	860E	Bonnash gravelly silt loam, 15 to 35 percent slopes
138E	Winfall-Courville complex, dry, 8 to 30 percent slopes	392D	Rumblecreek gravelly loam, 8 to 15 percent slopes, stony	862E	Beaverdump gravelly loam, 15 to 35 percent slopes
143E	Waldbillig-Holloway gravelly silt loams, 8 to 30 percent slopes	392E	Rumblecreek gravelly loam, 15 to 30 percent slopes, stony	867E	Glaciercreek gravelly silt loam, cool, 8 to 30 percent slopes
143F	Holloway-Waldbillig gravelly silt loams, 30 to 50 percent slopes	411E	Sacheen-Rock outcrop complex, 8 to 30 percent slopes	867F	Glaciercreek gravelly silt loam, cool, 30 to 45 percent slopes
144E	Waldbillig-Holloway gravelly silt loams, cool, 8 to 30 percent slopes	421B	Selon fine sandy loam, moist, 0 to 4 percent slopes	871G	Stevie-Rock outcrop complex, 40 to 70 percent slopes
144F	Holloway-Waldbillig gravelly silt loams, cool, 30 to 50 percent slopes	421D	Selon fine sandy loam, moist, 4 to 15 percent slopes	884E	Loneman silt loam, 15 to 35 percent slopes
148C	Bigarm gravelly loam, cool, 2 to 8 percent slopes, very stony	421E	Selon fine sandy loam, moist, 15 to 30 percent slopes	884F	Loneman silt loam, 35 to 60 percent slopes
148E	Bigarm gravelly loam, cool, 8 to 25 percent slopes, very stony	422F	Selon-Bemishave complex, 15 to 60 percent slopes	887E	Stevie gravelly silt loam, 15 to 35 percent slopes
150E	Bigarm-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	441F	Tevis-Rock outcrop complex, 30 to 60 percent slopes	891B	Stargulch very fine sandy loam, 0 to 4 percent slopes
150F	Bigarm-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	471D	Elkrock cobbly silt loam, 4 to 15 percent slopes, extremely bouldery	893A	Bigbeaver silt loam, 0 to 2 percent slopes, frequently flooded
151A	Revais silt loam, gravelly substratum, 0 to 2 percent slopes	472B	Elkrock gravelly silt loam, moist, 0 to 4 percent slopes	895A	Ibex silt loam, 0 to 2 percent slopes
152E	Bigarm, cool-Hogsby-Rock outcrop complex, 8 to 30 percent slopes	472D	Elkrock gravelly silt loam, moist, 4 to 15 percent slopes	897C	Mollman gravelly loam, 2 to 8 percent slopes
152F	Bigarm, cool-Hogsby-Rock outcrop complex, 30 to 60 percent slopes	472F	Elkrock gravelly silt loam, moist, 30 to 60 percent slopes	897E	Mollman gravelly loam, 8 to 30 percent slopes
153F	Hogsby-Finleypoint-Rock outcrop complex, 30 to 60 percent slopes	473D	Elkrock-Selon complex, 4 to 15 percent slopes	971E	Mollman gravelly loam, dry, 15 to 30 percent slopes
166E	Battlebutte-Bigdraw-Welded tuff outcrop complex, 15 to 30 percent slopes	513A	Sonyok silty clay loam, 0 to 4 percent slopes	971F	Mollman gravelly loam, dry, 30 to 50 percent slopes
166F	Battlebutte-Welded tuff outcrop complex, 30 to 60 percent slopes	522F	Winfall-Courville complex, 30 to 60 percent slopes	DA	Denied access
168D	Bigdraw-Battlebutte gravelly loams, 4 to 15 percent slopes	532E	Winkler-Sharrott-Rock outcrop complex, 8 to 40 percent slopes	DAM	Dam
197C	Remount-Bowlake complex, 2 to 12 percent slopes	541C	Yellowbay gravelly loam, moist, 2 to 8 percent slopes	W	Water

CONVENTIONAL AND SPECIAL
SYMBOLS LEGEND

SOIL SURVEY FEATURES

CULTURAL FEATURES

SOIL DELINEATIONS AND SYMBOLS



Blowout	
Clay spot	
Escarpment, bedrock	
Escarpment, other	
Gravel pit	
Gravelly spot	
Marsh or swamp	
Mine or quarry	
Rock outcrop	
Saline spot	
Sandy spot	
Short steep slope	
Sodic spot	
Spoil area	
Stony spot	
Very stony spot	
Wet spot	

AD HOC FEATURES

Bouldery	
Lake sediment outcrop	
Pothole	
Rubble land	

BOUNDARIES

National, state, or providence	
County or parish	
Reservation (national or state forest or park)	
Limit of soil survey (label)	
Map sheet neatline	
Public land survey system section boundary	

ROAD EMBLEMS & DESIGNATIONS

Federal	
State	

Symbol Definitions

LABEL	NAME	DESCRIPTION
•*	Bouldery	Areas of surface rock fragments greater than 23 inches in diameter. Typically less than 5 acres.
☺	Blowout	A small saucer-, cup-, or trough-shaped hollow or depression formed by wind erosion on a preexisting sand deposit. Typically less than 5 acres.
✱	Clay spot	A spot where the surface texture is silty clay or clay in areas where the surface layer is sandy loam, loam, silt loam, or coarser. Typically less than 5 acres.
YAYAYAYAYAYAY	Escarpment, bedrock	A relatively continuous and steep slope or cliff, which was produced by erosion or faulting, that breaks the general continuity of more gently sloping land surfaces. Exposed material is hard or soft bedrock.
AVAVAVAVAVAVA	Escarpment, other	A relatively continuous and steep slope or cliff, which generally is produced by erosion but can be produced by faulting, that breaks the continuity of more gently sloping land surfaces. Exposed earthy material is nonsoil or very shallow soil.
✕	Gravel pit	An open excavation from which soil and underlying material have been removed and used, without crushing, as a source of sand or gravel. Typically less than 5 acres.
•:	Gravelly spot	A spot where the surface layer has more than 35 percent, by volume, rock fragments that are mostly less than 3 inches in diameter in an area of surrounding soil with less than 15 percent fragments. Typically less than 5 acres.
①	Lake sediment outcrop	Exposures of glacial lake sediments composed of alternating layers of clay and silt, termed varves. These exposures support little or no vegetation and resemble areas of badlands from a distance.
☹	Marsh or swamp	A water-saturated, very poorly drained area, intermittently or permanently covered by water. Sedges, cattails, and rushes dominate marsh areas. Trees or shrubs dominate swamps. Not used in map units where the named components are “poorly drained” or “very poorly drained.” Typically less than 5 acres.
✕	Mine or quarry	An open excavation from which soil and underlying material are removed, exposing the bedrock. Also used to denote surface openings to underground mines. Typically less than 5 acres.
●	Pothole	A shallow, saucer-shaped area slightly lower than the surrounding glacial landscape but without a natural outlet for surface drainage.
▼	Rock outcrop	An exposure of bedrock at the surface of the earth. Not used where the named soils of the surrounding map unit are shallow over bedrock or where “Rock outcrop” is a named component of the map unit. Typically less than 5 acres.
⊕	Rubble land	An area that has more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens.
+	Saline spot	An area where the surface layer has an electrical conductivity (EC) of 8 mmhos cm ⁻¹ more than the surface layer of the named soils in the surrounding map unit, which have an EC of 2 mmhos cm ⁻¹ or less. Typically less than 5 acres.
✱	Sandy spot	A spot where the surface layer is loamy fine sand or coarser in areas where the surface layer of the named soils of the surrounding map unit is very fine sandy loam or finer. Typically less than 5 acres.

Symbol Definitions

LABEL	NAME	DESCRIPTION
.....	Short, steep slope	Narrow soil area that has slopes that are at least two slope classes steeper than the slope class of the surrounding map unit.
Ꞥ	Slide or slip	A prominent landform scar or ridge caused by fairly recent mass movement or descent of earthy material resulting from failure of earth or rock under shear stress along one or several surfaces. Typically 1 to 5 acres.
∅	Sodic spot	An area where the surface layer has a sodium adsorption ratio that is at least 10 more than the surface layer of the named soils in the surrounding map unit, which have a sodium adsorption ratio of 5 or less. Typically less than 5 acres.
≡	Spoil area	A pile of earthy materials, smoothed or uneven, resulting from human activity. Typically less than 5 acres.
◦	Stony spot	A spot where 0.01 to 0.10 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has no surface stones. Typically less than 5 acres.
⊙	Very stony spot	A spot where 0.1 to 3.0 percent of the surface cover is rock fragments that are greater than 10 inches in diameter in areas where the surrounding soil has less than 0.01 percent of a surface cover of stones. Typically less than 5 acres.
⚡	Wet spot	A somewhat poorly drained to very poorly drained area that is at least two drainage classes wetter than the named soils in the surrounding map unit. Typically less than 5 acres.